THE FERNS

OF GREAT BRITAIN AND IRELAND.

NATURE-PRINTED.

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BY

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Deinde singulis stirpium historiis vivas et ad naturæ æmulationem a nullo unquam, puto omnium diserto, artificiosius expressas imagines adjecimus; idque nulla alia de causa quam ut ea quæ crudis verbis exponit historia certius exprimeret atque adeo altius animo infigeret picturæ.
—*Fuchsius de Historia stirpium Commentarii; præf.*

NATURE-PRINTED

BY

HENRY BRADBURY.

LONDON:
PUBLISHED BY BRADBURY AND EVANS, WHITEFRIARS,
PRINTERS EXTRAORDINARY TO THE QUEEN.
MDCCCLV.

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PREFACE.

EVERYONE who has attempted to ascertain the name of a plant by comparing it with mere descriptions, is aware of the difficulty of effecting the object unless he is more familiar with the technical language of science than those commonly are who, although admirers of delicate texture, beautiful colour, or graceful form, do not profess to be skilful Botanists. Even with the aid of drawings, investigation often leads to no satisfactory result, in consequence of the inability of art to represent faithfully the minute peculiarities by which natural objects are often best distinguished. If this is so with plants in general it is most especially true of Ferns, the complicated forms and tender organisation of which baffle the most skilful and patient artist, who can only give at the best an imperfect sketch of what he supposes to be their more important features. And herein lies the great defect of all pictorial representations. The draughtsman can do no more than delineate a part of what he sees; and whether he sees correctly what he delineates will at all times be a matter of doubt, especially where, as in natural history, minute accuracy is indispensable. But if minute accuracy is of more vital importance in one than another race of plants, it is most especially so among Ferns, in the distinctions of which the form of indentations, general outline, the exact manner in which repeated subdivision is effected, and most especially the distribution of veins scarcely visible to the naked eye, play the most important part. To express such facts with the necessary accuracy, the art of a Talbot or a Daguerre was insufficient, nor could they be represented pictorially until NATURE-PRINTING was brought to its present state of perfection.

Attempts were long since made to obtain Botanical portraits by printing from the plants themselves, flattened and otherwise prepared for the purpose. By this means impressions of leaves were produced with some success, and even of small branches. Rude as the process was, and imperfect the result, it was nevertheless found that the figures thus procured were far more characteristic than any which artists could produce, as was to be expected, indeed, from the absolute accuracy of the representations as far as they went. No one who had ever seen a Rose-leaf could fail to recognise its impression, or was likely to mistake it for that of an Ash-tree; and the more the impression was studied, the more did the truth of all its details carry conviction to the mind. The fault of the method consisted in its limited application, and its incompleteness.

The process of the Imperial Printing Office at Vienna, to which the name of Nature-Printing has been happily applied, and to which the Work now offered to the public owes its origin, is a great improvement upon the old method, inasmuch as it represents not only general form with absolute accuracy, but also surface, hairs, veins, and other minutiæ of superficial structure by which plants are known irrespective of the hidden details of their internal organisation. Moreover, an exact copy in copper of the part to be represented being employed by the printer, instead of so fragile an object as the plant itself, we obtain the means of multiplying copies to the same extent as in copperplate engraving; and hence the method becomes suitable for purposes of publication. The Germans have already availed themselves of the art, and with considerable success. Von Heufler has published a specimen of the Cryptogamous plants of the Valley of Arpasch,* some of the figures in which are admirable representations of nature; and other works are announced as having made their appearance, or being in preparation, in the Austrian dominions.

* Specimen Floræ Cryptogamæ vallis Arpasch Carpatis Transylvani; auscripsit Ludovicus Eques de Heufler. Vienna, 1853. Imperial folio.

PREFACE

It is in emulation of such continental efforts that the present Work has been prepared, with the [illegible] kcable evidence what differences really exist among the Ferns wh[illegible] wild in Great Britain and Ireland. These beautiful plants have of late years [illegible] tion, and are now so universally cultivated, that it has become most desirable to establish upon solid [illegible] to expect from m[illegible] [illegible]ptions or imperfect engravings. It is true that Nature-Printing has its defects as well as [illegible] advantages: it can only represent what lies upon the surface, and not the whole even of that. But, on the other hand, its accuracy is perfect as far as it goes; and in the case of British Ferns it goes far enough for all practical purposes. If it fails to rep[illegible] the forms of sori, thecæ, or indusia, we must never [illegible] are subjects of inquiry in the cabinet. The practised eye knows at a glance that a Fern is *Adiantum Capillus Veneris* not by looking to the underside of its leaves, and ascertaining the form of its indus[illegible] or annulus, and the place occupied by the sori, but by its general manner of growth, the ramification of its stipes, and the form of its leaflets, all which Nature-Printing does [illegible] [illegible] Pr[illegible]g cannot be applied, are sufficiently pointed out by description alone [illegible] the present Work at least, are in no need of delineation. It is not, indeed, too much to say that in many other plants besides Ferns a [illegible] dispensed with if it were possible accurately to represent by figures, or to describe by words, the real forms and condition of the larger organs. But, when [illegible] with the result of Nature-Printing, botanical drawings are often little more than indifferent diagrams. It is related of the late John Gough of Kendal, that, having become totally blind from small-pox when two years old, he so cultivated his other senses as to recognise by touch, smell, or taste, almost every plant within twenty miles of his native place. It is believed that good Nature-Printing will convey to the eye the same class of positive impressions as those which were conveyed to the mind of Gough by other organs.

T[illegible] ext of the present Work is supplied by Mr. Thomas Moore, whose little *Handbook of British Ferns* is generally admitted to be our best book on the subject. To a perfect acquaintance with this part of our native Flora, Mr. Moore has shown that he adds correct views of nomenclature, and knows how to [illegible] of judgment which have induced inexperienced [illegible] upon which the modern genera of Ferns have been proposed. It may be, however, conceded [illegible] importance with the form, or absence or presence of an indusium, or the direction in which it separates from the [illegible] But in the application of any such characters to the distinction of genera, someth[illegible] than a mere perception of facts; it is no less necessary that the Botanist should possess a power of combining and generalising, as well as of observing, and that he should consult his judgment as w[illegible] his eyesight. When this is neglected the value of characters is misunderstood, every [illegible] genus and natural history is resolved into its elem[illegible] isolated uncorrected facts [illegible] skilful combinations, and what should be the perfection of arrangement becomes a farrage of desultory opinions. It is believed that the present Work will be free from faults of this k[illegible] and that the Author while he avails himself of all circumstances which can assist in the distinction of what requires to be [illegible]

The duty of the writer of these remarks extends little beyond a general supervision of the Work as it passes thr[illegible] The labour and honour of this the first English attempt at applying Nature-Printing to Botanical Science rest with Mr. Henry Bradbury under w[illegible] are prepa[illegible] and Mr. Thomas Moore, who selects the specimens to be figured, and is responsible for the letter-press.

Acton Green, March 20, 1855.

JOHN LINDLEY

AUTHOR'S PREFACE.

THE peculiarities of the process by which the Illustrations to the *Ferns of Great Britain and Ireland* have been produced, being adverted to in another page, it is unnecessary here to allude to them, further than to point out the fidelity with which the outline of the specimens is reproduced, and also how admirably the peculiarities of the vascular structure—which is of real importance in the classification of this family—are represented by Nature-printing. The process itself has been described by Mr Henry Bradbury in a lecture delivered before the Royal Institution.

There is, however, one feature of the accompanying text, on which some explanation may be desirable, in order that its object and intention may not be misapprehended. It has been attempted to record, and to give some account of the multitudinous variations of the comparatively few species of Ferns inhabiting these islands, which, even in so limited a geographical area as that of Great Britain and Ireland, have been met with by diligent explorers within the very few years which have elapsed since the love of Ferns has become so widely diffused as it now is. It will be apparent, from the subordinate position assigned to them, that no botanical importance is claimed for most of the forms thus enumerated, but the object of recording them has been two-fold.

In the first place they have been specially noticed for the purpose of affording aid to those Fern-admirers, including not a few of the gentler sex and of high estate, who derive such agreeable recreation as that afforded by Natural History studies, in seeking and finding, in collecting, and in cultivating, the species of Ferns, prolific of varied forms, and which for the most part have to be sought amidst enchanting rural scenery, where both mind and body derive benefit from the pursuit. Such students of Nature have a right to whatever assistance they may draw from records like the present; and it is for their special behoof that the varieties we have had occasion to notice have been mentioned under distinctive names.

We believe, however, that the long series of variations enumerated, have a botanical significance; and it is this, in the second place, which has led us to notice them with some particularity. They are not indeed, in many instances, objects which the general botanist can attempt to keep separate under distinct names even as varieties, those only which are most prominently placed having this importance claimed for them. But they are undoubtedly links in the chain of evidence which may direct him to the conclusion that species have a wider range of form, even within narrow geographical limits, than many botanists are willing to admit. They may also teach him that the variations of different plants of admitted specific rank, often serve to connect the individuals into a series so extended, that species themselves thus become things of doubtful import, and of uncertain limit. This lesson, again, surely leads to the conclusion that species are mere groups of individuals associated by the Naturalist for his own convenience and that of others, just as genera are groups of the so-called species collected together with the same end in view. The fact that such closely united series of forms which would ordinarily be referrible to several species admitted to be distinct but which for this very reason cannot be absolutely defined, and the total failure of all attempts to explain practically what a species is, point forcibly, if not irresistibly, to the conclusion that Nature acknowledges only individuals, and that a species is a thing of man's contrivance, and hence has only an artificial value.

Apart from this consideration, another obtrudes itself. Admitting the existence of species, whether

natural or artificial in character. then, if in a small area like that of Great Britain [illegible] often marked, and usually constant in character occur, the variations must become much more numerous and marked, if the species is spread, as often happens, over widely separated and extensive portions of the globe. It may safely be concluded from this further view of the subject, that an infinity of species, founded on slight differences and often on the mere fact of geographical separation, are thus thrown open to doubt, or at once reduced to mere local variations. Many apparently genuine species also thus become broken down and amalgamated by the discovery of connecting varieties, it may be, at their antipodes. The number of apparently good species so-called which thus become disturbed by the occurrence of intermediates [illegible] natural diffusion and variation of specific vegetable types from any intelligible centre of creation which in that case would be a necessary assumption and all such conjectures as to origin are mere assumptions and an affectation of being wise above that which is written,—become a serious obstacle in the way of continuing to hold faith in the very existence of species [illegible] convenience.

One object of enumerating the varieties of British Ferns then, has been to prove, that so-called species do vary very much in our limited area, and hence to draw the inference, sufficiently supported indeed by facts, that they vary much more when a wider range is taken into account, such a conclusion being clearly unfavourable to the multiplication of species. It is to be remembered that the variations here spoken of, though sometimes slight, are nevertheless often marked, and for the most part constant and appreciable, by no means frequently ranging as mere monstrosities, but even then for the most part permanent, and renewable from the spores—this latter fact probably affording incidental proof that spores themselves are in reality buds, and not at all analogous to seeds, and suggesting that the sori may after all have nothing to do with fructification in the usual sense.

It only remains here to acknowledge the much assistance which has been afforded us in the progress of our labours, all of which it is hoped has been duly recorded. Our thanks are however especially due to Sir W. J. Hooker for the facilities afforded by ready access to his valuable Herbarium in tracing the geographical range of the species; to Dr Lindley for his careful supervision; and to Mr G. B. Wollaston for his valuable notes on varieties.

[illegible]

SYNOPTICAL TABLE OF THE PLATES.

POLYPODIACEÆ.—Ferns with circinate vernation; their spore-cases girt with a jointed ring, and bursting by an irregular fissure.

POLYPODIEÆ.—Dorsal-fruited Ferns; sori roundish, naked, *i.e.*, non-indusiate.

Sori [illegible] paired.

Polypodium [illegible], and varieties	Plate	I–II
Polypodium Phegopteris		IV
Polypodium Dryopteris	"	V
Polypodium Robertianum		I.
Polypodium alpestre, and variety	"	VII.

Sori roundish, laterally confluent, concealed by the reflexed margins.

Allosorus crispus	"	V–I.

GRAMMITIDEÆ.—Dorsal-fruited Ferns; sori linear, forked, naked.

Gramma gramma leptophylla	"	XLIII. B

[illegible] sori, has the indusium obsolete. See ASPLENIEÆ.

ASPIDIEÆ.—Dorsal-fruited Ferns; sori roundish, indusiate, *i.e.*, covered by a scale, dorsal on the veins.

Sori covered by peltate indusia, affixed centrally.

Polystichum Lonchitis	Plate	IX.
Polystichum aculeatum, and varieties	"	X–XI
Polystichum angulare, and varieties	"	XII–XIII

Sori covered by reniform indusia, affixed by the sinus.

Lastrea Filix-mas, and varieties		XIV–XVII
Lastrea [illegible]	"	XVIII
Lastrea [illegible], and varieties	"	XIX–XX.
Lastrea spinulosa		XX
Lastrea dilatata, and varieties		XXII–XXVI
Lastrea [illegible]		XXVII
Lastrea Oreopteris		XXVIII
Lastrea [illegible]	"	XXIX

ASPLENIEÆ.—Dorsal-fruited Ferns; sori linear or oblong, indusiate, lateral on the veins.

Sori single, oblong, curved or hippocrepiform, the indusia fringed on the free margin; veins free.

Ashyrum [illegible], and varieties	Plate	XXX.–XXXIV

Sori single, linear or oblong, straight, oblique, indusium not fringed; veins free.

Asplenium fontanum		XXXV. A
Asplenium lanceolatum		XXXV. B
Asplenium Adiantum nigrum, and varieties	"	XXXVI., XXXVII
Asplenium marinum, and varieties		XXXVIII.
Asplenium [illegible], and varieties	"	XXXIX.
Asplenium viride, and varieties	"	XL
Asplenium Rutamuraria, and varieties	"	XLI. A
Asplenium germanicum		XLI. B.
Asplenium [illegible]	"	XLI. C.

Sori [illegible] oblique [illegible], the indusia opening face to face; veins free.

Scolopendrium vulgare, and varieties	Plate	XLII

Sori simple, oblong, [illegible] chiefly venter, indusium obsolete; veins netted.

[illegible]	Plate	XLIII. A

BLECHNEÆ.—Dorsal-fruited Ferns; sori indusiate, linear, intramarginal.

[illegible] Spicant, and varieties	"	XLIII. C

PTERIDEÆ.—Dorsal-fruited Ferns; sori indusiate, linear, marginal.

Sori continuous on the margin of the frond, therefore marginal.

Pteris aquilina, and varieties	"	XLI

Sori interrupted on the reflexed spires of the lobes, therefore resupinate.

Adiantum [illegible]		XLV

SYNOPTICAL TABLE OF THE PLATES

WOODSIEÆ.—Dorsal-fruited Ferns; sori involucrate or semi-involucrate [illegible] with a scale affixed beneath the sorus.

[illegible]

C[illegible]	[illegible]
[illegible]	[illegible]
C[illegible]	[illegible]

[illegible]

W[illegible]	[illegible]
W[illegible] alpina	[illegible]

HYMENOPHYLLEÆ.—Marginal-fruited Ferns; sori involucrate [illegible] receptacles

[illegible]

Trichomanes [illegible]	XLVIII

[illegible]

H[illegible]	XLIX
H[illegible]	[illegible]

OSMUNDACEÆ.—Ferns with circinate vernation; their spore-cases without a jointed ring, two-valved.

[illegible] regalis	[illegible]

OPHIOGLOSSACEÆ.—Ferns with plicate vernation; their spore-cases without a jointed ring, two-valved.

[illegible] on a separate branch of the frond

B[illegible]	[illegible]

[illegible] separate branch of the frond

Oph[illegible]	[illegible]
Oph[illegible]	

PLATES I. II. III.

THE COMMON POLYPODY (POLYPODIUM VULGARE).

POLYPODIUM, *Linnæus.*

Clusters of Spore-cases circular, without covers, growing from the back of the veins, [illegible] or nearly so. *Veins* [illegible] at their extremities, their branches [illegible] simple, forked or rarely pinnate.

P. VULGARE, fronds deeply pinnatifid, linear-oblong or ovate-oblong acuminate; the [illegible] linear-oblong bluntish or acute, obscurely serrate.

POLYPODIUM [illegible] *English Botany* [illegible] *Flora Britannica* [illegible] *Flora* [illegible] *Bolton, Filices Britannicæ* [illegible] *Flora* [illegible] *British Flora* [illegible] *Manual of British Botany* [illegible] *Ferns of Great Britain* [illegible] *Moore, Handbook of British Ferns* [illegible] *Flora Hibernica* [illegible] *Species Plantarum* [illegible] *Sprengel, Systema* [illegible] *Filices* [illegible]

POLYPODIUM [illegible], *Moore* [illegible]

POLYPODIUM [illegible] *Willdenow, Herbarium* [illegible] *and of gardens.*

POLYPODIUM [illegible] of Linnæus [illegible] *Polypodium* [illegible] the former apparently [illegible] state of *Polypodium vulgare* [illegible] *Polypodium* [illegible] There is [illegible]

POLYPODIUM [illegible] *MS.* [illegible] *Filicum* [illegible]

POLYPODIUM [illegible] *Hooker and Arnott, Botany of Beechey's Voyage*, 105.

[illegible] *Appendix to Phytologia*, 1851 [illegible] *History of British Ferns*, 11.

Var. SEMILACERUM, fronds pinnatifid and fertile above, bipinnatifid below; lobules distinct, linear acute serrate.

POLYPODIUM VULGARE SEMILACERUM, *Link, Filicum Species Hortobergensis*, 127.

POLYPODIUM VULGARE [illegible], *Moore, Handbook of British Ferns* [illegible] *Sowerby, Ferns of Great Britain* [illegible]

POLYPODIUM [illegible], *Analysis of the British Ferns* [illegible] 22 (not of Willdenow).

POLYPODIUM VULGARE [illegible]

POLYPODIUM [illegible] CAMBRICUM, *Smith, English Flora* [illegible] (in part).

POLYPODIUM [illegible] *Filicum* [illegible]

Var. CAMBRICUM, fronds barren, bipinnatifid throughout; lobules crowded, linear or linear-lanceolate acuminate, serrate.

POLYPODIUM [illegible] CAMBRICUM, *Willdenow, Species Plantarum*, v. 173; *Bolton, Filices Britannicæ* [illegible] *Smith, English Flora*, [illegible] (in part); *Moore, Handbook of British Ferns* [illegible]

POLYPODIUM CAMBRICUM, *Linnæus, Species Plantarum* [illegible]

POLYPODIUM [illegible], *Flora* [illegible]

EXPLANATION OF THE PLATES.

PLATE I.—POLYPODIUM VULGARE, **A**, from Mayford, Surrey; *T. M.* **B**, from wall at Merrow, Surrey, *T. M.* **C**, from road-side wall at Callander, Perthshire; *T. M.* **D**, from Inversnaid, Stirlingshire; *T. M.* **E**, POLYPODIUM [illegible] **F**, [illegible]

PLATE II. **A**, [illegible] **B**, [illegible] from [illegible] *S. O. Gray.*

PLATE III. **A**, POLYPODIUM [illegible] *Wollaston.* **B**, [illegible] from [illegible]

HABITAT. [illegible]

GEOGRAPHICAL DISTRIBUTION. [illegible]

THE COMMON POLYPODY

Rhizome creeping, tortuous, branched [illegible] clothed with ferruginous scales [illegible] lanceolate, very much acuminated, crowded, at length deciduous, leaving the surface [illegible] smooth and greenish. *Fibres* brown, tomentose, densely matted over the surface [illegible] rhizome is fixed.

Stipes variable, often nearly or quite as long as the frond, sometimes much shorter, as well as the rachis slightly grooved in front, naked, at the base articulated with the rhizome.

Vernation circinate.

Frond from two to eighteen inches long, lateral to the rhizome, subcoriaceous, of a [illegible] green, paler beneath; varying in outline from triangular-ovate when small, to ovate-oblong and linear-oblong, the latter being the fully developed condition of the species in its normal state; very deeply pinnatifid, usually more or less drooping. *Lobes* or *segments* linear-oblong, parallel, flat, bluntish or [illegible] shorter and more crowded or confluent near the apex which sometimes terminates abruptly, but is usually [illegible]

[illegible] the branches (*venæ*) are again branched, producing from three to five alternate branchlets [illegible]

Fructification on the back of the frond, usually confined to its upper part, the sorus originating at the apex of the venule, at first a naked depressed scarcely visible spot, and from the earliest period at which it becomes visible quite destitute of any membranous cover, or indusium. *Sori* or *clusters of spore-cases* circular, rarely somewhat oblong, quite exposed, arranged in a linear series on each side the midvein, at first distinct, often crowded and finally confluent. *Spore-cases* yellow or orange of various shades, becoming tawny, numerous, globose, with a slender stalk of elongated cells. *Spores* yellow, [illegible] or corrugate, oblong or kidney-shaped.

Duration. The rhizome is perennial. The fronds are produced about the end of May, and are persistent through the winter and until after new fronds are produced, so that the plant is evergreen, unless the fronds are destroyed or damaged by severe frost. Other fronds are produced later in the summer.

This common plant is the type of the Linnæan genus *Polypodium*. There are certainly no grounds other than the fancies of name-makers by reason of which that genus should be abolished, although there may be reasons for its reduction by divesting it of ill-assorted species. We cannot therefore concur with those writers who, adopting the name used for sectional distinction by Blume and Presl, would call this plant *Ctenopteris vulgaris*, and thus altogether ignore Linnæus's *Polypodium*. Whatever additional names the introduction of modern systems of classification may render necessary, it is clearly not permissible that the names of type species of *bonâ fide* established genera, where these can be recognised, as in this case, should be wantonly remodelled. Those who are easily led either to make or to adopt changes of this nature, should remember, that names are not the ultimate [illegible]

The common Polypody differs essentially from all the other British Polypodies [illegible] of having its fronds articulated with the rhizome—that is, attached in such a manner that they separate spontaneously as they approach decay. Its texture, too, is stouter and firmer than that of the native species which are allied to it by their fructification. In its normal form, it is, moreover, less divided than they. The small specimens produced on walls, and in other dry exposed places, are erect and rigid; but in situations where it grows with more vigour, the plant becomes drooping, and [illegible]

A.B.C.D. Polypodium vulgare
E. P.vulgare acutum. F. P.vulgare bifidum.

THE COMMON POLYPODY

This Fern is easily cultivated, if light porous soil is used, and the rhizomes are kept on the surface of the soil. When unnaturally planted deeply, or in stiff retentive soil, it dwindles and often eventually perishes. Mr Newman, apparently founding his opinion on the circumstance of its being frequently met with growing on pollard trees, considers it to be of parasitical habit. This circumstance would, however, give it only an epiphytal not a parasitic character, but as it is frequently found, fully as vigorous, growing among porous earth and on sandstone, these are all probably mere accidental conditions, the essential ones being constant moisture more or less in quantity, perfect drainage, and moderate shade. It even exists in health naturally with little or none of some of these conditions about it, as many an old wall bears evidence. It increases readily by dividing the branching rhizome.

There are in this species many deviations from the typical form which has been already described, but they are rather of importance to the horticultural enthusiast than to the botanist except in so far as the latter may regard them as evidences of the manner in which, and the extent to which, common species are known to vary, and may hence learn to appreciate rightly the less familiar differences which are found to exist amongst exotic species. It is, however chiefly for the information of the now numerous class of Fern cultivators, most of whom take an interest in these variations that they will be enumerated hereinafter under distinguishing appellations.

That form of the Common Polypody which differs in the least degree, albeit constantly from the normal state, has the ends of its lobes gradually tapering off to a narrow point, instead of being nearly equal in width to the end, and there more or less blunt. A somewhat more diverse form has the points of the lobes acute as in the last, but their margins are at the same time deeply notched, the notches forming a series of coarse double serratures. This state has sometimes a tendency to bifurcation at the tips of the lobes, and what is more remarkable, the sori are not unusually decidedly oblong, in which respect it deviates from the generic type. Another slightly varying form has the ends of some or all of the lobes divided with the divisions divaricate, so that the lobes become more or less manifestly two-forked. Occasionally more than two points are developed to each lobe, and we have thus an indication of the nature of the tasselled apices which are common in some other species of Ferns.

Sometimes the fronds acquire breadth rather than length, assuming a broad oblong or ovate lanceolate outline, and this is occasionally accompanied by various degrees of marginal division in the primary lobes, showing a transition towards the more highly developed bipinnatifid varieties, *semilacerum* and *cambricum*. The most simple condition of this abbreviated and widened form, in which the apices are usually acute and the margins finely serrated, and which is almost or quite identical with the North American plant called *P. virginianum*, and nearly so with the Madeira plant called *P. canariense* in gardens, is apparently not common in this country, but has been communicated from near Hereford by Dr. Allchin. It is when deeply crenato-lobate, that this type of variation approaches the more highly developed or compound forms above alluded to, this, too, sometimes varies with oblong sori.

The Irish Polypody—P. VULGARE SEMILACERUM—(see PLATE II.), of which type there appears to be some slight variations, and which, moreover, is not confined to Ireland—has the fronds irregularly bipinnatifid, in this respect approaching the Welsh Polypody, but the latter is more regularly and universally bipinnatifid, and is, likewise always barren, whilst the former is more or less fertile. The fronds are from a foot to a foot and a half long, elongate-ovate, pinnatifid, in the lower part almost pinnate. The primary lobes are narrow and deeply serrate at the base and apex deeply pinnatifid about the middle, the secondary lobes or lobules are linear, acute or blunt-ish serrate, largest at the lower part of the frond, becoming shorter upwards. Along these lobules the veins from the principal midvein extend, and become branched, the branches dividing into from two to three veinlets, in the other parts, the veins are arranged similarly to those in luxuriant examples of the normal form. The upper half of the frond is fertile, and in this fertile portion the lobes are scarcely subdivided, the uppermost ones being merely serrate or crenato-serrate, the development of the lobules, and of the sori are coarse

[illegible] not generally coincident on the same parts. It should [illegible] apparently when the vigour of the plant has received some check, the entire fronds, instead of the upper [illegible] *sinuatum* of Mr Francis, [illegible] so named by Willdenow. Our plant was found many years since in Ireland, in woods near the Dargle [illegible] of Wicklow [illegible] been lately found in several stations by Dr A Irban. In some one of its modifications it has also been found at Postwich, in Norfolk (*Hb. Hooker*), at Saltwood Castle, in Kent (*Hb. Gray*), on the ruins of Berry Pomeroy Castle, in Devon, at Tintern Abbey, and Chepstow Castle, in Monmouth (*Hb. Howard*), [illegible] Aberglaslyn, in Carnarvonshire (*Hb. Allchin*), and elsewhere. It grows, moreover, in Germany, at [illegible] in Portugal, and we believe the *P. australe* of Fée, which is met with in Sardinia, Corsica, and Teneriffe, to be a form of this variety. Its most beautifully developed state is that from the Dargle, and [illegible] description is made from a remarkably fine specimen of that form, communicated by Mrs. De[illegible]

The Welsh Polypody—P. VULGARE CAMBRICUM—(see PLATE III.) is, like the last, an extremely elegant plant, but it is almost always sterile. The fronds are regularly bipinnatifid throughout [illegible] outline ovate or ovate-oblong. The lobes are crowded, narrow at the base, and [illegible] divided into narrow linear or linear-lanceolate, acute or acuminate, serrated, crowded lobes. This form, which is chiefly known as a garden plant, does not, we believe, ever produce fructification [illegible] cultivation, and it is very rarely indeed that it is produced in the wild plant. It has been found at Montpelier, though originally in Wales—hence the name. Mr E. J. Lowe has communicated it [illegible] wood near Macclesfield, in Cheshire. Mr E. T. Bennett has favoured us with specimens from the neighbourhood of Ross, in Herefordshire, which are almost identical in structure with the Welsh plant, and others quite similar, gathered at the same time, are stated by him to be sparingly fructified.

For the following enumeration of the various forms above mentioned, with some other abnormal ones which are more or less constant, we have to express our thanks to Mr G. B. Wollaston, whose name is well known among those familiar with British Ferns as that of one who collects with assiduity the numerous variations [illegible] success. These abnormal forms belong to two types of development, one, in which the [illegible] of the normal form [illegible] rather than length, resulting in a frond of broad outline comparatively short. To the first of [illegible] belong the varieties numbered below from 1 to 11 inclusive, and the remaining numbers, 12 to 17 inclusive, are referable to the second.

Of *Polypodium vulgare* there are no less [illegible] varieties [illegible] other to bear different names, but at the same time, and particularly in a state of cultivation, [illegible] compared [illegible] The [illegible] The only one, however, that is constant under all circumstances is the variety *cambricum*. They may be described as follows:

[illegible] has the ends of the lobes narrowed gradually to a point, and is without serratures. [illegible] normal [illegible], [illegible] becoming less tapering, and slightly serrulate, approaching towards the acute-lobed normal form.

2. *bifidum* has the lobes generally bifid or two-cleft, but sometimes multifid; this occurs most on the lower third of the frond, sometimes reaching to two-thirds, and occasionally but very [illegible] nearly to the apex. The fronds are otherwise normal. It is not unfrequent.

3. *ramosum* is a more fully developed form of the foregoing, and is often ramified in the rachis, which is again divided, and is furnished with lobes also bifid or multifid. It is very [illegible]

NATURE PRINTING.

A. Polypodium vulgare semilacerum. B. P. vulgare serratum.

NATURE PRINTING.

A. Polypodium vulgare cambricum. B. P. vulgare crenatum.

4. *interruptum*, as its name implies, has the lobes interrupted or irregular, sometimes two, three or four entirely wanting; they are also irregularly bifid or multifid, or curiously laciniated; the outline of the frond is linear-lanceolate, i. e. normal. This variety is rare.

5. *sinuatum* is a form allied to the last named, but very distinct; the lobes are beautifully sinuous or waved, rarely divided at the apices as in *interruptum*, but irregularly lobate, the lobes sharply serrate. It is a rare form, and under culture for some years, has proved permanent. The fronds are of the usual outline.

6. *laciniatum*: in this variety the lobes are of different lengths, and simply but irregularly notched, and somewhat crisped or reflexed.

7. *marginatum*: this form of variation is occasional but rare in *Polypodium*, though frequent in *Scolopendrium*. Its peculiarity consists in the splitting of the epidermis on the margins of the lobes, and in its receding, generally on the under side of the frond, towards the midvein; the lobes themselves are irregularly serrate. Otherwise the fronds are normal.

8. *serrulatum* is a rare variety, having the teeth of the lobes minutely serrate; it has been generally met with growing on the trunks of trees. The plant is rather dwarf in habit, with fronds of the normal outline, and has for some years proved constant under cultivation. [It was found in Devonshire by Mr. Wollaston.]

9. *multifidum* is generally like the normal form, or the variety *serratum*, except that the apex of the frond is bifid or multifid.

10. *auritum*: the peculiarity of this variety consists in the lobes not being simply decurrent, but forming a broad wing to the rachis; and the first lobules next the rachis on the *upper* margin (not, as is more usual, the lower), are greatly enlarged, forming a kind of ear from which it takes its name. The outline of the fronds is normal.

11. *serratum*: the lobes in the most typical state of this form are sharply and deeply serrate or even biserrate along their margins, and the apices are acute. It is rather a common form of the species, with fronds nearly of the usual outline, and with a tendency in the sori to become oblong. It varies, however, with the fronds rather broader, and the teeth rounded and sometimes partially enlarged into lobes, thus connecting this form with the variety *crenatum*.

12. *denticulatum*: this form has fronds less coriaceous than usual, of a broad oblong outline, abrupt from the uppermost lobes being scarcely shorter, and caudate at the apex; all the lobes are ascending and distantly sharp-toothed. It was found near Hereford. Analogous forms occur in Portugal, and North America.

13. *ovatum*: this is allied to the last mentioned, but the fronds, which vary in size, are ovate rather than oblong; they are more coriaceous, with the lobes more obscurely toothed or crenelled; the lowermost lobes are horizontal, and the upper ones decrease in size. It seems to be common in Madeira and the Azores, and has been gathered by Dr. Allchin at Ballavaughan, in the west of Ireland.

14. *crenatum*: this is usually a large form, approaching *semilacerum* by its broad or ovate fronds and often, lobed segments. It varies considerably; in some instances approaching *serratum*; in other instances having the lobes more or less deeply and unequally crenate or crenato-lobate; and sometimes having the sori oblong. The notches of the lobes are rounded, not acute, as in *serratum*; and the lobes themselves are in some states of [illegible] waved or undulated. It is not common, but is found in Kent, in Surrey, and in Wales; the most marked examples being those from Saltwood found by Mr. Gray and those from Conway found by Dr. Allchin. The finest undulated form is a garden plant of obscure history, but one nearly identical and which will probably become quite so under cultivation was found by Dr. Allchin at Mucruss, in Ireland.

15. *truncatum*: this is generally a more compound form, approaching *semilacerum*; the lobes being [illegible] serrated or lobed, and the lobules minutely serrated; but in some instances, as its name implies, the development of the frond is, from some unknown cause, arrested so that [illegible]

[illegible] leafy portion [illegible] were supplied by [illegible] which project and form various points. The fronds [illegible] It was [illegible] projecting [illegible] seem constant. It was found [illegible] portion.

16. [illegible] this is the most common kind of [illegible] *[illegible]*, [illegible] under cultivation. The fronds are elongate [illegible] the [illegible] themselves lobes, and in some instances [illegible] it is known generally as the Barg[illegible] Fern. Sometimes the fronds [illegible] occur in various degrees of development. The name [illegible] to [illegible] been given [illegible] the lobes [illegible] of the lower half of the frond.

17. *[illegible]* this is [illegible] most beautiful of all known varieties of *Polypodium* [illegible] the most complete [illegible] forms [illegible] *[illegible]* [illegible] primary lobes [illegible] overlapping [illegible] somewhat crossed [illegible] leaves are [illegible] the whole frond [illegible] however two or three pairs of lobes scarcely smaller than those on the middle portion of the frond, which gives squareness or angularity to the base. A deficient lobe [illegible] forms a [illegible] of a frond of the variety *serratum*.

TW[illegible] EXPLANATORY OF THE TERMS EMP[illegible] DESCRIPTI[illegible]

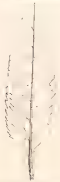


Plate IV.

THE MOUNTAIN POLYPODY, or BEECH FERN
(Polypodium Phegopteris).

POLYPODIUM, *Linnæus.*

Clusters of Spore-cases circular, without covers, growing from the back of the veins, terminal or nearly so. *Veins* disunited at their extremities, their branches (*venules*) simple, forked or rarely pinnate.

P. Phegopteris: fronds ovate-triangular, acuminate, pinnate below; pinnæ lanceolate, the lower pair distinct, sessile, usually deflexed, pinnatifid; lobules linear-oblong, blunt; upper pinnæ confluent.

Polypodium Phegopteris, *Linnæus, Species Plantarum*, [illegible] *Bolton, Filices Britannicæ*, 36 [illegible] *Smith, Flora Britannica*, 1116; *English Botany*, [illegible] *English Flora*, [illegible] 269; *Newman, Phytologia Britannica*, [illegible] *Hooker and Arnott, British Flora*, [illegible] *Babington, Manual of British Botany*, [illegible] *Sowerby, Ferns*, [illegible] *Moore, Handbook of British Ferns*, [illegible] *Mackay, Flora Hibernica*, 337; *Schkuhr, Kryptogamische Gewächse*, [illegible] *Willdenow, Species Plantarum*, [illegible] *Sprengel, Systema Vegetabilium*, [illegible]

Polypodium [illegible] *Mackay*, [illegible] 271.

Polypodium [illegible] *Salisbury, Prodromus*, 403.

Polystichum Phegopteris, *Roth*, [illegible]

Lastrea Phegopteris, *Newman*, [illegible] 1851, 47; *British Ferns*, [illegible]

Phegopteris [illegible]

Gymnocarpium Phegopteris, *Newman, Phytologist*, iv. 371; *Appendix*, 185[illegible]; *History of British Ferns*, [illegible]

EXPLANATION OF THE PLATE.

Plate IV. Polypodium Phegopteris: from Ambleside, *Miss S. Beever.*

HABITAT. This species is rather widely dispersed, and not unfrequent, throughout Great Britain, occurring most abundantly in the north of England and in Scotland, [illegible] shady humid places, and usually districts which are more or less mountainous. In the south-eastern parts of England it appears to be wanting, but it is found rather plentifully both in Sussex and in [illegible] It [illegible] Wales, and [illegible] the Hebrides, and Orkney, Shetland, and the Isle of Man. In Ireland it is rare, occurring principally in the northern and eastern provinces. [illegible] to upwards of 3000 feet in the western highlands.

GEOGRAPHICAL DISTRIBUTION.—This Fern is scattered widely throughout Europe, extending from Iceland and the Scandinavian countries southwards [illegible] Europe to Spain and Italy. In Asia it [illegible] and also [illegible] extending along the [illegible] (*W. Hooker*). Algeria, in Africa, is also [illegible] America, where it [illegible] known under the name of *P. connectile*, [illegible] Labrador on the eastern side, to Prince William's Sound on the western, [illegible] southwards on the Rocky Mountains to Canada, and to the northern United States (*W. Hooker*).

Rhizome creeping extensively, branched, tough, slender about the thickness of a straw, dark-brown, pilose and slightly scaly while young, the older portions denuded both of scales and hairs. *Scales* lanceolate, golden-brown, intermixed with other cobwebby hair-like ones. *Fibres* numerous, much branched, dark-brown, invested with golden-brown cobwebby deciduous pubescence.

Stipes as long as, or more frequently longer and often much longer than the frond, erect, brittle, pale-green, furnished near the base with a few lanceolate acuminate pale-brown scales which are soon deciduous, and on the upper part with a few scattered subulate scales, the whole length clothed with minute reversed hairs: distant and lateral on the rhizome.

Vernation circinate, the pinnæ rolled up separately towards the rachis, which is then rolled from the point downwards.

Fronds from four to eighteen or twenty inches in length, including the stipes, adherent to the rhizome, membranaceous, of a dull pale-green, hairy, ovate-triangular, much acuminate, pinnate below, the apex of the frond pinnatifid. *Pinnæ* deeply pinnatifid, linear-acuminate, nearly or quite opposite

[illegible] towards the apex of the pinnæ. [illegible] veins, or when divided, [illegible] short distance from the edge of the lobule.

Fructification on the back of the frond, scattered almost [illegible] the [illegible] and often becoming confluent in lines. Where the fructification is but partial [illegible] small, numerous, pale-brown. *Spores* [illegible].

Duration. The rhizome is perennial. The fronds are annual, produced about May, and destroyed by the early frosts of autumn.

This Fern is readily known from its congeners by its outline, which is ovate-triangular with an elongated [illegible] by the [illegible] of [illegible].

The fronds in this species become lateral and distant on the underground rhizome, in consequence of its rapid elongation, and they are adherent, that is to say their stipes is not furnished with any articulated point of spontaneous separation. The [illegible] to mark out generic groups, and cannot be permitted to override the characters afforded by the [illegible] the fructification, is that of the medial not terminal position of the sori on the veins. M. Fée had already founded his [illegible]

[illegible]

The Mountain Polypody [illegible]

Polypodium Phegopteris.

PLATE V

THE SMOOTH THREE-BRANCHED POLYPODY, OR OAK FERN (POLYPODIUM DRYOPTERIS)

POLYPODIUM, *Linnæus*

Clusters of Spore-cases circular without covers, growing from the back of the veins, terminal, or nearly so. *Fronds* disarticulated at their extremities, their branches (*venules*) simple, forked or rarely pinnate.

P. DRYOPTERIS, fronds pentangular-deltoid, ternate, smooth, membranaceous [illegible] pinnate, pinnæ deeply pinnatifid (sometimes pinnate at the base), lobes [illegible] pinnules, oblong, obtuse, crenate or pinnatifid-crenate, stipes glabrous.

Polypodium Dryopteris, *Linnæus, Species Plantarum* [illegible] *Flora* [illegible] *English Flora* [illegible] *Hooker and Arnott, British Flora* [illegible] *Manual of British Botany* [illegible] *Moore, Handbook of British Ferns*, 2nd ed. [illegible] *Sprengel Systema Vegetabilium* [illegible]

Polypodium [illegible]

Polypodium Dryopteris [illegible]

[illegible] Dryopteris, *Newman* [illegible] *British Ferns*, 2nd ed. [illegible]

[illegible] Dryopteris [illegible]

[illegible] Dryopteris, *Newman*, [illegible] *Appendix*, [illegible] *History of British Ferns*

EXPLANATION OF THE PLATE

PLATE V. Polypodium Dryopteris, from Ambleside, Westmoreland, [illegible]

HABITAT.—This Fern, though not a common plant, is rather widely dispersed in Great Britain. It is very rare in Ireland, [illegible] Its northern and north-western [illegible] England [illegible] 2500 feet in the West Highlands. It occurs principally in [illegible] with *P. Robertianum*.

GEOGRAPHICAL DISTRIBUTION.—The distribution of this Fern in Europe is general. [illegible] found at North Cape [illegible] Lapland, Sweden and Russia, in Germany, Hungary and [illegible] in Great Britain, France, Switzerland, Italy, Spain and [illegible] Siberia and Kamtschatka, in [illegible] Africa. In the New World [illegible] Rocky Mountains [illegible] (*Sir W. Hooker*), as well as throughout the United States and in Newfoundland. [illegible]

Rhizome creeping extensively, branched, tough, slender, about the thickness of a straw, dark brown, almost black, the younger portions scaly. *Scales* like those of the stipes, pale semi-transparent brown, lanceolate. *Fibres* dark brown, branched, apparently without pubescence.

Stipes very much longer than the fronds, frequently twice or thrice their length, erect, slender, brittle, tinged with purple, and furnished near the base with a few scattered pale-brown lanceolate deciduous scales, otherwise smooth and glabrous, lateral on the rhizome, and somewhat distant. *Rachis* quite smooth, that of the central branch deflexed of the lateral branches spreading.

Vernation circinate, the lateral and lower pair of branches rolled up separately from the remaining central portion, so that the young fronds resemble, as Mr Newman expresses it, three little balls on wires at the top of the stipes.

Fronds from four to twelve or fourteen inches in height, including the stipes, the leafy portion averaging four or five inches, adherent to the rhizome, delicately membranaceous, bright green, quite smooth, in form deltoidly pentangular, the pentagon being described by the points of the three

branches and those of the two basal pinnules of the lower branches, which latter diverge [illegible] represent two separate angles. The fronds are ternate, that is, they consist of three nearly equal portions or branches, as indicated by the vernation. *Branches* pinnate or subbipinnate, differing from each other chiefly in this, that while the upper or central one has its sides nearly equal, the two lateral ones have the pinnæ on their lower side larger, sometimes twice as large as those on the upper side, so that they are obliquely triangular. *Pinnæ* opposite, variable in outline from ovate to linear oblong, acute, usually pinnate at the base, pinnatifid above, and acute as well as nearly entire at the apex; those of the central branch more decidedly pinnate than those of the lateral ones. *Pinnules* or *lobules* oblong obtuse, crenate or crenato-lobate, smaller and less divided towards the apex.

Venation of the more compound, that is the crenate-lobate pinnules, consisting of a flex[illegible] with alternate *veins*, one to each lobe, these veins pinnato-furcately branched, the *venules* extending to the margin. The veins of [illegible] few [illegible] venules. The [illegible] vein[illegible] bears a sorus some distance [illegible]

Fructification on the back of the frond, and spread over its whole surface. *Sori* small, [illegible] consisting of numerous crowded spore-cases quite uncovered, arranged in a linear often crowded series along each side of the pinnules near to but distinctly within the margin, the sori being seated [illegible] distance below the apex of the venules. Sometimes the fronds are less abundantly fructified, and the sori appear distant and scattered. *Spore-cases* small, dark-brown, roundish-obovate, attached by a [illegible] *Spores* [illegible]

Duration. The rhizome is perennial. The fronds are annual, produced about April, and in succession [illegible]

The [illegible] *P. Robertianum* [illegible] to differ. It can, however, hardly be supposed that those who have seen tolerably good examples of both would hesitate to admit their distinctness. *P. Dryopteris* differs from *P. Robertianum* in having a loose spreading habit, while the fronds of the latter are rigid and erect, with stouter stalks and ribs, and a [illegible] strictly the case with the latter, although by a misapplication of terms it is sometimes so described. *P. Dryopteris* is decidedly three-branched, as its vernation, compared to three [illegible] wires, certifies; whilst in *P. Robertianum*, as Mr. Newman well states, the three corresponding portions of the frond never assume [illegible] globe, the pinnæ roll in on the rachises, and the entire frond upon its rachis, so that the frond is of the ordinary bipinnate structure. Of less botanical importance perhaps, but equally or still more clearly available as distinguishing characteristics, are, the perfect smoothness of *P. Dryopteris*, compared with the glandular pubescence of *P. Robertianum*, most readily seen on the stipes and rachis, but equally [illegible] mark the plants as abundantly distinct.

Most writers describe a cruciform figure as being formed by the basal pinnules of the opposite [illegible] in *P. Dryopteris*; and it is sometimes figured, as in Mr. Newman's work, in a very [illegible] specimens we have never seen it in any marked degree [illegible] pinnules (the upper pair) are smaller and nearly parallel, w[illegible] divergent.

This species is a moisture-loving plant, although, as in most [illegible] be stagnant. It is also peculiarly a shade-loving Fern, for [illegible] exist[illegible] shade and shelter of some kind is afforded it. It is a good [illegible] grows readily in pots. It increases with facility by division of [illegible]

Polypodium Dryopteris.

THE LIMESTONE POLYPODY (POLYPODIUM ROBERTIANUM)

POLYPODIUM, *Linnæus*

Clusters of spore-cases circular, without covers, growing from the back of the veins, terminal or nearly so. *Veins* [illegible] at their extremities, their branches (*venules*) simple, forked or rarely pinnate.

P. ROBERTIANUM: fronds erect, rigid, glandulose, pentangular deltoid, subternate; lower branches (or pinnæ) bipinnate, stalked, their pinnulets (or lobulets) oblong obtuse, crenate or nearly entire; the rest sessile; stipes glandulose.

[illegible] Robertianum [illegible] *Deutschlands Flora* [illegible] *British* [illegible]

Polypodium [illegible] *Flora* [illegible] *English Botany* [illegible] 27. [illegible] 43. [illegible] *British Flora* 56. [illegible] *Species Polypodium* 210. [illegible] *Pteridographia* [illegible]

Polypodium [illegible] *Botany of the Northern United States* 323.

[illegible]

Lastrea [illegible] *Naturalist* [illegible] 232. Newman, *Naturalist's Almanac* [illegible]

Lastrea Robertiana [illegible] *British Ferns* [illegible] 17.

Gymnocarpium Robertianum [illegible] *Phytologist* [illegible] *Appendix* 85; [illegible] *History of British Ferns*, 63.

Phegopteris [illegible] *Genera Filicum* 247.

EXPLANATION OF THE PLATE.

P[illegible] VI. [illegible] from Lydbrook, Gloucestershire. [illegible] *H. Purvis*.

HABITAT.—This species is not known to occur in Ireland; in Scotland it [illegible] England [illegible] Somersetshire [illegible] or upwards. [illegible] Wales. [illegible]

GEOGRAPHICAL DISTRIBUTION.—The plant appears to be met with over a considerable part of Europe, as for example in Norway, [illegible] France [illegible] Germany [illegible] Asia [illegible] Himalaya mountains at an elevation of [illegible] (*Sir W. Hooker*). In North America it occurs both in the United States (*Dr. Lindley*) and in Canada.

Rhizome creeping extensively, branched, thicker than a straw, dark-brown, scaly. *Scales* pale brown, semitransparent, lanceolate. *Fibres* dark-brown, branched, clothed with a brighter brown cobwebby pubescence.

Stipes [illegible] often twice as long, stout [illegible] when young, becoming stiff and erect, sometimes slightly scaly about the base, and with a few scattered deciduous scales upwards when young, minutely glandular, pale watery green, dulled by the glandulosity of the surface; lateral to the rhizome, distinct, adherent. *Rachis* glandulose, the part forming a stalk to the lower pinnæ much shorter, and distinctly smaller, than that between the first and second pairs of pinnæ.

Vernation circinate; the pinnules rolled up separately into little globules, the pinnæ then rolled each separate inwards towards the main rachis, which is next itself coiled up.

Fronds six to eighteen inches in height, including the stipes, which is usually more than half, [illegible] two-thirds at least, of the length; erect, of a firm herbaceous texture, deep dull greyish green, glandulose, deltoidly-pentangular but with the pentagonal less manifest than in *P. Dryopteris*, in consequence of the less comparative length of the stalks of the lower pinnæ. The fronds are not truly ternate, [illegible] the larger size of the lower pinnæ gives them a subternate appearance; they are

[illegible] sometimes [illegible] most developed.

Pinnæ variable, opposite below, the lower pair largest, obliquely triangular, stalked, often bipinnate; the [illegible] stalked or sessile, pinnate-pinnatifid; the upper ones adnate, sessile, pinnate or pinnatifid [illegible]. *Pinnules* of the lower pair larger on the posterior side [illegible] [illegible] sometimes [illegible].

[illegible] *Fructification* [illegible] of [illegible] [illegible] or very [illegible] forked [illegible] [illegible] Of the [illegible] [illegible] soriferous veins [illegible] branches [illegible].

Fructification on the back of the fronds [illegible] spore-cases [illegible] each [illegible] [illegible] *Spores* [illegible] small [illegible] *Spores* [illegible].

Duration. The rhizome is perennial. The fronds [illegible] [illegible] May, and the latest [illegible].

W[illegible] species as [illegible] represented [illegible] *Polypodium* [illegible] [illegible] genus *Polypodium* [illegible] of species [illegible] intelligible, and though extensive is not unwieldy. Mr Newman would separate from it the three plants above referred to, under the name of *Gymnocarpium*, which [illegible] characters [illegible] of generic value. [illegible] remarked, proposed at a much earlier date a nearly correspon[illegible] and M. Fée had adopted this group under the name of *Phegopteris* as a genus, in his admirable [illegible] *Filicum*, distinguishing it by a character which would be of far more importance than the [illegible] the rhizome, if constant, namely that of having medial sori, or, in other words, the [illegible] sori [illegible] which produce, at the same time, both medial and terminal sori, so that the character is not distinctive. The three species referred to possess, however, in common, a peculiarity of some importance, their fronds being [illegible].

The chief differences between *P. Robertianum* and *P. Dryopteris* have been already pointed out under the latter species. The most important of these [illegible] fronds [illegible] [illegible] leaves [illegible].

This is [illegible] [illegible]. This [illegible] by [illegible] [illegible] exposure [illegible] rhizome affords a ready means of propagation.

PLATE VII

THE ALPINE POLYPODY (POLYPODIUM ALPESTRE).

POLYPODIUM, *Linnæus*.

Clusters of Spore-cases circular, without covers, growing from the back of the veins, terminal, or nearly so. *Veins* disunited at their extremities, their branches (*venules*) simple, forked or rarely pinnate.

P. **ALPESTRE**, fronds lanceolate, herbaceous, sub-erect, bipinnate; pinnæ narrow lanceolate from a broad base, spreading or ascending; pinnules ovate-oblong, or subfalcately ovate-lanceolate, pinnatifid; segments oblong, bluntish, serrate; stipes short; secondary rachis narrowly winged; (sori rarely spuriously indusiate).

POLYPODIUM ALPESTRE, *Sprengel, Systema Vegetabilium*, iv., part 2, 320. *Hoppe*, *Pl. exs.*, sec. *Koch, Synopsis*, ed. 2, 974. *Moore, Handbook of British Ferns*, 60. *Henfrey, in Francis's Analysis of British Ferns*, 5 ed. 28, supp. plate, fig. 2 a. *Sowerby, Ferns of Great Britain*, 84, t. 40.
POLYPODIUM RHÆTICUM, *Pallas*, *Itin.*, iii. 28. *Ledebour, Flora Rossica*, iv. 510. *Fries, Summa Vegetabilium*, 82. *Woods, Tourist's Flora*, 423 (not of Linnæus).
ASPIDIUM ALPESTRE, *Hoppe, Taschenbuch*, 1805, 216. *Swartz, Synopsis Filicum*, 421. *Schkuhr, Kryptogamische Gewächse*, 58, t. 60, (excl. syn. Linn.).
ASPIDIUM RHÆTICUM, *Swartz, Schrader's Journal für die Botanik*, 1800, ii. 41.; *Synopsis Filicum*, 59. *Willdenow, Species Plantarum*, v. 250, (excl. syn. Linn.)
ASPIDIUM DISTENTIFOLIUM, *Tausch*, according to Struchel.
PSEUDATHYRIUM ALPESTRE, *Newman, Phytologist*, v. 370; *Appendix*, 1851; *History of British Ferns*, 199.
ATHYRIUM ALPESTRE, *Rylands, in litt.*

Var. **FLEXILE**, fronds slender, flaccid, narrow lanceolate, bipinnate; pinnæ short, ovate-lanceolate, spreading or deflexed; pinnules oblong, obtuse or acutish, narrowed below, sessile or adnate, distantly lobed or toothed; stipes very short.

POLYPODIUM FLEXILE, *Moore, Handbook of British Ferns*, 226. *Henfrey, in Francis's Analysis of British Ferns*, 5 ed. 29, supp. plate, fig. 2 b.
PSEUDATHYRIUM FLEXILE, *Newman, Phytologist*, iv. 974; *History of British Ferns*, 203.
ATHYRIUM? FLEXILE, *T. Moore, MS.*, in litt.

EXPLANATION OF THE PLATE.

PLATE VII. POLYPODIUM ALPESTRE: **A**, from Glen Dole, Clova, Forfarshire, *G. Moore*. **B**, from Braemar, Aberdeenshire, *A. Croall*. **C**, from Lochnagar, Aberdeenshire, *W. Sutherland*. **D**, P. ALPESTRE FLEXILE, from Glen Prosen, Clova, *J. Backhouse*. **E**, The same, cultivated, *at Clapham*.

HABITAT.—This plant has been as yet so far as relates to the United Kingdom, found only in the highlands of Scotland, where in the mountainous districts of the counties of Forfar, Aberdeen, and Perth, as we learn from memoranda communicated by Mr. G. Lawson of Edinburgh, it is one of the most abundant of Ferns, exceeded perhaps only in frequency by *Lastrea Oreopteris*, in the Clova district, descending to about 2000 feet above the sea, and perhaps lower, and associated with *Athyrium*, in Aberdeenshire, ascending nearly or quite to 4000 feet. Mr. James Backhouse, jun. also states that in the Clova mountains it occurs in company with *Athyrium*, at from 2000 to 3000 feet elevation, above which, at from 3000 to 4000 feet, the latter disappears and *P. alpestre* becomes abundant. Mr. H. C. Watson, by whom it was first found but undetermined so long since as 1841, gathered it in the corrie of Ben Aulder, a lofty mountain in the west side of Loch Ericht in Inverness-shire. It is probably dispersed throughout the highlands, and may even occur further southward, on the high mountains of Wales and the North of England. In the hill sides in exposed places, the fronds are very commonly damaged either by winds, spring frosts, or by animals, and it is only in the more sheltered localities that perfect specimens can be obtained. The variety *flexile* has been only found in Glen Prosen, Clova, Forfarshire, by Mr. Backhouse.

GEOGRAPHICAL DISTRIBUTION.—In Europe, this species is found in Norway, Sweden, and Lapland; in Russia, both in Livonia on the west, and the Ural mountains on the east; in the Alps of Switzerland and in Germany. Meyer found it on the Caucasus. A scarcely distinguishable plant, perhaps identical, was collected by Barclay at Sitka, in North West America (*Hk. Hooker*).

Caudex short, erect or decumbent, consisting of the persistent crowded bases of the fronds attached around a central axis, the whole forming a stout roundish mass, frequently tufted.

scaly above. *Scales* numerous, broadly or narrowly ovato-lanceolate, pale-brown. *Fibres* stout, branched.

Stipes short, from about one-sixth to one-fourth of the entire length of the frond, stout, swollen near the base, clothed sparingly with ovate-lanceolate pale-brown scales, terminal and adherent to the caudex. Rachis stout, rounded behind, channelled in front; the rachis of the pinna furnished with a very narrow leafy wing on both sides, connecting the pinnules.

Vernation circinate.

Frond from one to three feet and upwards in height, erect or ascending, herbaceous, dark dull green, lanceolate, the base narrowed in about the same degree as the point, bipinnate, or subtripinnate. In fronds, of which the leafy portion measures about twenty inches in length, the greatest breadth is about six and a half inches. *Pinnæ* broadly linear or lanceolate from a broad base, tapering to a narrow point, numerous, crowded above, more distant below, spreading or somewhat ascending. *Pinnules* ovate-oblong, sometimes ovato-lanceolate, or oblong-ovate, acute, with a narrow attachment at the base, but connected by a narrow membranous wing which borders the rachis; they are deeply pinnatifid, and in the most vigorous fronds so much so, and the segments so far distant from each other as to appear again pinnate. *Segments* oblong obtuse, sharply serrate, especially at the apex and on the anterior margin. The subtripinnate fronds have the segments doubly toothed.

Venation of the pinnules consisting of a slightly flexuose midvein from which branch a series of alternate pinnate veins. *Veins* of the segments also flexuose, with simple alternate *venules*, one of which is directed to the point of each marginal tooth; the lowest anterior venule, which is directed towards the lowest anterior tooth, is usually soriferous, and when this only is so, the sori form a series on each side the midvein, at a short distance from it, and just above the sinus of the segments on their anterior margin; sometimes, however some of the other venules are also fertile, and the sori are then placed near the margin of the segments. In the subtripinnate fronds, which have the segments more or less doubly toothed, the venules are occasionally forked, the anterior veinlet, or sometimes both, bearing a sorus; in these examples the sori, three or four on each side the segment, form tolerably distinct submarginal lines. The sori are in all cases attached near to, but below, the apex of the vein, which reaches to the margin.

Fructification on the back of the frond, occupying the upper two-thirds of its length. *Sori* small, circular, usually distinct, but sometimes crowded, and becoming confluent; usually naked, but sometimes (rarely and in abnormal-looking sori) the spore-cases are somewhat lateral, and a membrane which appears to be an abnormal development of the receptacular expansion of the vein, is produced simulating an abortive or spurious indusium. *Spore-cases* roundish obovate, brown, numerous. *Spores* roundish or oblong, somewhat muriculate.

Duration. The caudex is perennial. The fronds are annual, growing up in April or May, and persisting early in autumn.

The Fern is at once distinguished among the British Polypodies by its short thick erect tufted caudex, and by the lanceolate form, and bipinnate or tripinnate mode of division of its fronds. It has certainly a general resemblance to *Athyrium Filix-fœmina*, with which it appears to have been very generally confounded, but the fructification, as usually borne, is very different, and even its resemblance to that species is not found to be so close as at first sight appears to be the case.

The short massive caudex with terminal adherent fronds, would lead those botanists who derive generic distinctions from the mode of development, to separate the present species from *Polypodium*. It does in fact represent one of the three new genera in which Mr. Newman has disposed [illegible] Polypodies which inhabit Great Britain.

The supposed 'indusia,' ascribed to this plant, we have noticed both in living plants of the species and in dried specimens of the variety *flexile*, but they are only occasional, and even rare, and appear

NATURE PRINTING.

Polypodium alpestre

never to occur in company with the more perfect sori, but only where the spore-cases are much fewer in number than usual. To us they had the appearance of lacerated membranaceo-filamentous expansions of those points of the veins which formed the receptacles, and they appeared to arise from some abnormal condition which had limited the power of producing spore-cases to the side or base of the receptacle, while on the upper side the cells of the receptacle had been directly prolonged into the indusioid membrane, but in no case have we seen what could be considered as a true indusium. On the other hand, Mr Rylands, of Warrington, who regards the plant as an *Athyrium*, has communicated the result of some observations made in 1855, in company with Mr. Wilson, from which the following passages are quoted —"In those sori which are large and fully ripe, the indusium could not be seen, though I imagine dissection would show traces of it. One sorus was found still closed, the spore-cases little developed, it was reniform, and lay alongside the venule. In many of the smaller sori remains of an indusium was seen, and in two or three it was as nearly perfect as one may expect to find it. The margin was lacinated with fine projecting points. The laciniated margins are produced by the rupture of the cuticle, and the fine points are the cell-walls thereof. The indusium is very tender, shrivels, and where the spore-cases are numerous, is speedily concealed or perhaps displaced by them; it is smaller than in the other forms of *Athyrium*. These peculiarities seem to result from the rupture of the cuticle taking place early in the progress of development of the sori, but that it has the true indusium of an Athyrium I think cannot be further disputed." Subsequently, Mr. Rylands writes —"The 'indusia' of *alpestre* are not, I think, confined to the imperfect sori, though after bursting they soon shrivel and disappear in the larger ones. I have compared it with *A. Filix-fœmina molle*, and though in texture, position, and general character, there was little difference, I am compelled to admit that in the case of *alpestre* the spore-cases seemed to lie within the proper cuticle of the frond, while the evidence of a distinct membrane was much clearer in *molle*. This supports your view to some extent, but, all things considered, is it sufficient to remove the plant from others so evidently its allies?" When so many of the sori—not only the majority, but all, with few exceptions, and those exceptions having strongly marked imperfect or abnormal characters—really appear to be the round naked masses of *Polypodium*, we have no alternative, repudiating as we do the other grounds of separation already adverted to, but to retain this plant in that genus.

The Flexile Polypody—P. ALPESTRE FLEXILE—(PLATE VII., D. E.) as communicated to us by Mr. Backhouse, is certainly a very distinct variety and may be a species, the former being the view adopted by its only discoverer, Mr. Backhouse, who writes —"Dissimilar as it is from *P. alpestre*, I shall continue doubtful of its specific difference if it does not turn up in other places." It differs in being more slender and flaccid, in having a much narrower outline, and consequently shorter pinnæ, with a considerably reduced number of pinnules, in the form of the pinnules, which are oblong, narrowed below, sessile or adnate, and distantly toothed, in the very short stipes, becoming obsolete in the cultivated plants, and in a tendency to bear perfect sori at the base of the frond, while the apex is barren—the reverse of what usually happens. The absence of stipes, which Mr Newman includes in his definition is not constant, the wild specimens sent by Mr Backhouse having a distinct stipes of about a couple of inches, this part, however, is always very short. The fronds are from six or seven to twelve or fourteen inches in length, the pinnæ, spreading or more or less deflexed, short, with about six or eight pairs of pinnules. The sori are few, six or eight on a pinnule, usually distinct. In the cultivated plant the clusters are very numerous in the lower half, and scarcely extend upwards beyond the middle of the frond, but this character is not constant, one frond communicated by Mr Clapham, and the wild fronds from Mr Backhouse, being fructified throughout, and another obligingly forwarded by Mr Newman being fertile both at the base and apex. In this latter, which was only sparingly fructified, the spore-cases appeared for the most part to be attached to the side of the vein, and the sori were slightly elongated rather than circular, indicating an affinity with *Athyrium*, and there was in some cases a peculiar membranaceo-filamentous development in the position of an indusium, again indicating

affinity with the ciliated indusia of *Athyrium*, but at the base and apex of the frond, the more perfect sori were without trace of this indusium growth, and truly polypodioid. It seems to be a difficult plant to cultivate in the climate of the south of England, languishing, probably for too pure air and cool breezes of its northern home.

We have seldom seen cultivated plants of this species thriving with the vigour they possess in their natural fields except when grown fully exposed to the air in sheltered shady situations. When confined they often produce but puny and flaccid fronds. It roots, however, freely in a sandy compost of loam and peat, and with a free admission of air may be grown in situations where the necessary moisture of this nature from atmospheric impurities. In all cases where a pure atmosphere is enjoyed it will no doubt be found to grow better on the open rockery, than in pots under glass, and when, from the cases just mentioned, it is found requisite to adopt frame or house culture, the plants should be provided with as airy and light (though shaded) a situation as can be afforded. It may be increased by separating the lateral crowns of the caudex

We learn from those who have visited the native localities of this Polypody, that it is a very variable plant, but whether the variations are such as would be perpetuated under other conditions than those in which they naturally occur, we have as yet no information. The forms we have received have a great analogy with those of *Athyrium Filix-fœmina*, and the most striking of them are enumerated as sub-varieties below, with the object of recording, as we have done in the case of other species, the most marked modifications of development to which this is subject

1 *fœnile* (M.). This has been already noticed. It is a lax narrowed form, and bears perhaps in its irregular toothing, and singular habits of fructification, some indication of being a monstrous or abnormal variation, though we believe it is perfectly constant to the peculiarities above described. It Only found by Mr Backhouse, but in some quantity, in Glen Prosen, Cleva, Forfarshire

2 *lanceum* (M.). In this the fronds are large, stout, subtripinnate, the pinnules elongate, ovato-lanceolate or sometimes sublinear, subfalcate, deeply pinnatifid, with obtuse serrated segments, the lowest of which is almost separate. We have received it from Mr G. Lawson, and Mr Croall, gathered at the White Waterfalls and elsewhere in the Cleva mountains, Mr Croal has also communicated the same form from Lochnagar, Aberdeenshire

3 *trypinnatum* (M.). The fronds of this form are large, stout, tripinnate, the pinnules, which are from an inch to an inch and a half long, are oblong-ovate, with separate, oblong, secondary pinnules the upper of which are united by the wing of the rachis, but the lower are separate to their base. It is analogous to fine states of *Athyrium Filix-fœmina incisum*. Mr G. Lawson gathered it at the Wells of Dee, Aberdeenshire

The smaller and more usual—at least the more usually collected—forms of this plant are analogous to *Athyrium Filix-fœmina molle*, and the other less divided states of the Lady Fern, even these however, exhibit differences in habit, some being quite erect, while others are spreading. We suspect, also, that a dwarf barren monstrous shy-growing plant found by Dr. Dickie on Ben Macdhui, and hitherto referred to *Athyrium* (var *præmorsum*), belongs rather to this species.

PLATE VIII

THE MOUNTAIN PARSLEY FERN, OR ROCK BRAKES
(ALLOSORUS CRISPUS).

ALLOSORUS, *Bernhardi*

Clusters of Spore-cases round (or elongate oblong), springing from near the apices of the venules, distinct, at length becoming laterally confluent. *Indusium* none, simulated by the involute unaltered margins of the pinnules of the contracted fertile fronds which cover the sori. *Veins* simple, or forked from a distinct midvein; *venules* thickened at their extremities.

A. CRISPUS, fronds of two kinds, ovato-deltoid, bi-tri-pinnate; ultimate divisions of the sterile fronds obovate wedge-shaped, often bifid; of the fertile linear-oblong; sori roundish.

> ALLOSORUS CRISPUS, *Bernhardi, Schrader's Neues Journal der Botanik*, 1806, i. pt. ii. 5, 36. *Babington, Manual of British Botany*, 408. *Deakin, Florigraphia Britannica*, iv. 4. *Newman, History of British Ferns*, 35. *Moore, Handbook of British Ferns*, 78. *Sowerby, Ferns*, 79, 39. *Sprengel, Systema Vegetabilium*, iv. 65. *Presl, Tentamen Pteridographiae*, 152.
>
> ALLOSORUS SITCHENSIS, *Ruprecht, Beiträge zur Pflanzenkunde des Russischen Reiches, Distributio Cryptogamarum vascularium in Imperio Rossico*, iii. 50.
>
> OSMUNDA CRISPA, *Linnaeus, Species Plantarum*, 1522. *Bolton, Filices Britannicae*, iv. 7.
>
> OSMUNDA ... *Salisbury, Prodromus*, 402.
>
> PTERIS CRISPA, *Linnaeus*, MS. *Smith, Flora Britannica*, 1137. *English Botany*, xvi. t. 1160. *English Flora*, iv. 303. *Schkuhr, Kryptogamische Gewächse*, 90, 98. *Willdenow, Species Plantarum*, v. 395.
>
> PTERIS STELLERI, *Gmelin, Novi Commentarii Acad. Petropolitanae*, 1768, ... t. 1. Ruprecht.
>
> PTERIS ... *Lamarck, Flore Française* ...
>
> ... *Villars, Histoire des Plantes de Dauphiné*, iii. 838.
>
> ... *Hoffmann, Deutschlands Flora*, ...
>
> CRYPTOGRAMMA CRISPA, *R. Brown, Appendix to Franklin's Narrative of a Journey to the Polar Sea*, 754, 767. *Hooker and Arnott, British Flora*, 575. *Mackay, Flora Hibernica*, 343.
>
> ... *Desvaux, Annales de la Société Linnéenne de Paris*, ... 291. *Fée, Genera Filicum*, 30.
>
> ... *Gray, Natural Arrangement of British Plants*, ...

EXPLANATION OF THE PLATE.

PLATE VIII.—ALLOSORUS CRISPUS, from Coniston, Lancashire. *Miss M. Berry.*

HABITAT.—This Fern is met with rather plentifully, though locally, on the mountains of Scotland and those of the northern parts of England, and occurs sparingly in a few scattered places in the districts of the Mersey, the Trent, and the Severn, also in Devonshire. In Wales it occurs, though not abundantly, in several counties in the north, including the Snowdon district, while in South Wales it is more rare. In Ireland it is also rare, being recorded only from the counties of Down, Antrim, and Louth. It is a mountain plant, preferring rocky situations, and delighting to grow among boulders and loose stones, where it is protected from excess of moisture. It occurs nearly at the sea level in the moors of Lancashire; in North Wales it descends to about 400 feet, and in the West Highlands it ascends to an elevation of upwards of 3000 feet (1150 yards according to Mr. Watson).

GEOGRAPHICAL DISTRIBUTION.—The species is widely dispersed over Europe, occurring in the north in Lapland, Norway, Sweden, and Denmark; again in Great Britain and Ireland, in Germany, Hungary, Switzerland, and France, and thence extending southwards into Spain and ... It is found at Sitka (*Jos. Hooker*); Kaulfuss reports it from Kamschatka and islands in the North Pacific Ocean; but the plant which Ruprecht names *Allosorus foveolatus* is probably identical with the *Cryptogramma acrostichoides*, R. Brown. The East Indian *Cryptogramma Brunoniana* is very doubtfully distinct from *A. crispus*.

Caudex small, short, tufted, erect or decumbent, scaly. *Scales* membranous, pale brown, subulate. *Fibres* numerous, branched, dark brown, wiry, and slightly covered with small hair-like scales.

Stipes as long as, or usually longer than the frond, pale green, slender, smooth, with a few scattered scales near the base; adherent to the caudex. *Rachis* smooth.

Vernation circinate.

Frond from four to twelve inches high, including the stipes, herbaceous, of a lively green, terminal on the caudex, triangular or ovato-triangular in outline, of two forms, and hence described as dimorphous. *Sterile fronds* leafy, usually about as long as the stipes, bi- or tri-pinnate, smooth.

Pinnæ alternate or sub-opposite, triangular-ovate, spreading, the lower ones largest. *Pinnules* alternate, ovate, largest on the lower side of the pinnæ, pinnate or pinnatifid [illegible] ovate or obovato-cuneate; the latter or smaller ones, cut into linear acute teeth, and the former into cuneato-linear bifid lobules, having acute incurved teeth. The ultimate divisions are, however, variable in form, being sometimes oblong-oval, with sinuously shallow-toothed margins, [illegible] of development apparently representing fertile fronds, whose fructiferous growth has become arrested and abortive. *Fertile fronds* contracted, usually about one half as long as their [illegible] or even quadriplinate in the basal portions of the lower pinnæ. *Pinnæ* alternate [illegible] ovate, spreading, the lower ones largest. *Pinnules* alternate, ovate in outline, bipinnate or [illegible] pinnatifid in the lower pinnæ, pinnate only above. All the ultimate divisions are stalked, obtuse and linear-oblong from the involution of the margins, which are pale-coloured, crenated and indusioid.

Venation of the barren fronds consisting of a slender vein extending along each pinnule, and casting off a *venule* into each of its lobes or pinnulets, this again becoming alternately branched, so that a *veinlet* runs along the centre nearly to the point of each segment; simple where the segment is undivided and forked where it is bifid, a branch of the vein being directed towards every marginal tooth. In the fertile fronds a vein enters each ultimate division, and passes [illegible] its apex; this throws off alternate *venules*, which extend nearly to the margin, and are usually simple but sometimes forked, and bear a sorus near to their extremity.

Fructification on the back of the frond, and usually occupying the whole under surface. *Sori* small roundish, situated near the extremity of the venules; at first distinct though contiguous, ultimately becoming laterally confluent and forming a continuous line. No *indusium* is present, but the margins of the pinnulets, somewhat pallid but not altered in texture, are incurved over the sori. *Spore cases* small, elliptic-obovate, stalked. *Spores* smooth, roundish, oblong, or bluntly [illegible]

Duration. The caudex is perennial; the fronds are annual, spring [illegible] in May and June, and perishing in the course of the autumn.

The Parsley Fern is readily known by its dwarf tufted parsley-like appearance, coupled with the dissimilarity between its much-divided sterile and fertile fronds, of which the former have the segments broad, flat, and leaf-like, and the latter have them involute at the margin, so that they become contracted and somewhat pod-like or sinuiform. These features distinguish it from all other of our native ferns.

Few, if any, of the few species which are indigenous to Britain have given rise to such [illegible] conflicting opinions as to the genus to which it belongs. Linnæus, and the [illegible] to *Osmunda* and *Onoclea*. Of the other names which have been applied to it—all [illegible] the impression of its being a pteroid fern—that of Bernhardi claims priority [illegible] limitations. Presl, and subsequently Kunze, adopting Bernhardi's name [illegible] various true *Pteridæ* with which it has no affinity and which must consequently be again dissociated. The affinities of our plant have been well pointed out by Mr John Smith, who considers [illegible] pteroid, but polypodioid. It is, in fact, polypodio-grammitoid. The sori are [illegible] distinct, and the involution of the margin represents not an indusium but a contraction of the frond, the incurved parts being unaltered in texture, and not membranous, which they would be, if true indusia.

This fern is not difficult of culture under conditions which protect its fronds from the sun, and its roots and caudex from stagnant or accumulated moisture. In free well drained soil and in a cold shady frame it grows remarkably well, but should be guarded against [illegible] It may [illegible] division, but it is safer [illegible] to disturb a thriving plant for this purpose. [illegible] being consequently often [illegible] for a supply of plants, it may be hinted that, in the case of this, and other ferns which naturally occur among rocks [illegible] somewhat difficult to remove and establish, it is far better to select the younger and [illegible] the purpose of removal, than the larger and older masses which tempt the collector's hand.

STING.

Allosorus crispus.

PLATE IX

THE ALPINE SHIELD FERN, OR HOLLY FERN
(POLYSTICHUM LONCHITIS)

POLYSTICHUM, *Roth. Schott*

Clusters of Spore-cases circular, medial, rarely terminal on the venules, covered by an indusium, or membranous scale. *Indusium* orbicular, peltate, i.e. attached at or near its centre, the margin becoming free. *Veins* pinnato-furcate; *venules* direct, disunited at their extremities, the lower anterior one in each fascicle, on the fertile parts of the frond, bearing a sorus.

P. LONCHITIS fronds pinnate, narrow linear-lanceolate, rigid; pinnæ falcately lanceolate, acute, spinosely ciliato-serrate, the upper ones auricled at the base on the upper side, obliquely wedge-shaped or rounded on the lower; the lowest ones often with both an anterior and posterior auricle.

POLYSTICHUM LONCHITIS *Roth Flora Germanica* iii. 71. *Deakin, Florigraphia Britannica*, v. 89. *Babington, Manual of British Botany*, 411. *Sowerby, Ferns*, 80. t. 16. *Newman, History of British Ferns*, 104. *Moore, Handbook of British Ferns*, 83. *Presl, Tentamen Pteridographiæ*, 82. *Fee, Genera Paleæ*, 278.

POLYPODIUM LONCHITIS. *Linnæus, Species Plantarum*, 548. *Smith, English Botany*, xii. t. 797. *Bolton, Filices Britannicæ* 34, t. 19.

ASPIDIUM LONCHITIS, *Swartz, Schrader's Journal für die Botanik*, 800, ii. 30. *Smith, Flora Britannica*, 1148. *English Flora*, v. 271. *Hooker and Arnott, British Flora*, 568. *Mackay, Flora Hibernica*, 398. *Schkuhr, Kryptogamische Gewächse* 29. t. 29. *Willdenow, Species Plantarum*, v. 224. *Sprengel, Systema Vegetabilium*, iv. 97.

ASPIDIUM ASPERUM. *Gray, Natural Arrangement of British Plants*, ii. 6.

EXPLANATION OF THE PLATE.

PLATE IX. POLYSTICHUM LONCHITIS, from Ben Bulben, Sligo, Ireland, *N. B. Ward*.

HABITAT. This Fern may be considered as an alpine rock-plant. It is abundant on the mountains of the Scottish Highlands, where it has a range of from about 1200 feet to upwards of 3000 feet (1200 yards, *Watson*) above the sea. It descends to about 500 feet in Yorkshire. Its southern ascertained limit is in North Wales, in the county of Carnarvon. It is found again in Yorkshire and the Lake district, and more abundantly in the Highlands of Scotland, its northern limit being Ross-shire and Sutherlandshire, or perhaps Orkney, from which it has been reported. In Ireland it is found in the counties of Donegal, Leitrim, Sligo, Meath, and Kerry. There are dubious reports of its having been met with in the Scottish Lowlands, Lanarkshire, in South Wales, Hamorgan-shire, and in the district of the Cluse in England (Cambridgeshire, Northamptonshire), but these localities all need confirmation.

GEOGRAPHICAL DISTRIBUTION.—The Holly Fern would appear to be extensively distributed over Europe, especially in the northern and central portions, occurring in Ireland (*Hb. Lindley*), Lapland, Sweden, Denmark, Russia, Germany, Hungary, Great Britain and Ireland, France, Switzerland, Italy and southwards into Spain (*Hb. Hooker*, and *Mus. Pu*[illegible]), and Greece (*Hb. Hooker*, and *Mus. Brit.*). In Asia, it occurs in Kashmir (*Hb. J. Smith*), in the Bithynian Olympus (*Hb. Hooker*), and on the Russian Altai range, extending as far as Kamtchatka, whence it passes to the Rocky Mountains in North-West America (*Hb. Hooker*). A closely related species, the *Aspidium munitum* of Kaulfuss, intermediate between *P. Lonchitis* and *P. falcinellum* of Madeira, is found in California, and at Nootka Sound.

Caudex thick, slowly elongating, erect or decumbent, consisting of the densely packed bases of decayed fronds surrounding a central woody axis, and clothed in the upper part with the numerous scales which remain about the bases of the stipes. *Fibres* stout, rigid, branched, dark brown.

Stipes usually short, from half an inch to two inches, or sometimes in Welsh specimens three inches in length, clothed with large ovate or broadly lanceolate reddish-brown pointed chaffy scales; terminal and adherent to the caudex. *Rachis* densely scaly with narrower lanceolate and subulate pallid scales.

Vernation circinate.

Frond, from six to eighteen, or rarely twenty-four inches in length, deep green, paler beneath, of rigid leathery texture, erect or pendulous according to the conditions of growth, linear-lanceolate pinnate. *Pinnæ* undivided, numerous, with one of the margins, usually the anterior one, bent back from the plane of the rachis and usually crowded, so that when the frond is flattened they become

overlapping on the upper part of the frond, though distinct and sometimes distant below. They are very rigid, and have scattered over their under surface numerous small hair-like scales. They are moreover very shortly stalked or sessile, lanceolate-falcate, from three-quarters of an inch to an inch and a quarter in length in the widest part, having an acute point, and an acute auricle at the base on the anterior side, the base on the posterior side being obliquely sloped or rounded off in all the upper pinnæ, but often produced into a posterior auricle in the lowest ones. The margin is serrated, the serratures tipped by bristle-like processes, with minute intermediate teeth.

Venation generally indistinct, but often more conspicuous in specimens from Wales, where the growth seems more lax. There is a *midvein* extending to the apex of the pinna, and diverging from it at the very point where it enters the pinna, is a principal branch or vein which extends to the apex of the auricle; this branch is pinnately forked on the same plan as the midvein, but on a smaller scale. The rest of the *veins* on each side the midvein are pinnately forked, *i. e.*, they are branched, but the branches are so placed that at each ramification the vein seems to have separated into two nearly equal and but slightly diverging parts. In average specimens there are three or four of these ramifications to each vein near the base of the pinna, then two, and finally one in those near the apex. The *venules* and *veinlets* are lost in the substance of the frond just within the margin, one being directed into each marginal tooth. In smaller specimens the number of ramifications in the veins is fewer.

Fructification on the back of the frond, and usually confined to the upper half, though sometimes extending lower down. *Sori* round, indusiate, forming a line on each side the midvein halfway between it and the margin, and also in a similar way a line on each side the principal vein extending into the auricle; they are of variable size, but often large and crowded, and then generally become confluent in age; they are attached to the anterior branch of each fascicle of veins, and are medial, seated nearer to its base than its apex. *Indusium*, or cover to the spore-cases, membranaceous, orbicular, umbilicate and peltate, or attached to the receptacle by a short central stalk. *Spore-cases* numerous, globose, stalked, deep brown. *Spores* small, round or oblong, muriculate.

Duration. The caudex is perennial, and the plant evergreen, the fronds, which appear [illegible] in spring, attaining their maturity by the autumn, and remaining in full vigour through the winter onwards.

This plant may be taken as the type of *Polystichum*, a genus established by Roth several years prior to the publication of *Aspidium*, which has too long and too generally been allowed to supersede it. It is also the type of *Polystichum* in the restricted sense proposed by Schott, whose views we adopt.

It is known from perfectly developed states of the cognate species by its being simply pinnate, but imperfect and debilitated forms of them which sometimes occur are only pinnate, and from these it is distinguishable with difficulty. The rigidity of texture, the strongly spinous margin, and the tendency to rubrication in the pinnæ, offer the readiest marks of distinction from these anomalous congeners.

A normal forms of this species are very rare. Mr. W[illegible] has communicated [illegible] two following:

1. *multifidum*: this has the fronds divided at the apex. It is probably rather to be considered as an occasional and accidental variation than as a true variety in the [illegible] sense.

2. *proliferum*: this form produces small bulbils in the axils of the lowermost pinnæ, and these produce young plants when the fronds drop from decay.

The cultivation of *P. Lonchitis* will be noticed under that of the following species.

: PRINTING.

Polystichum Lonchitis.

PLATES X. XI.

THE COMMON PRICKLY SHIELD FERN
(POLYSTICHUM ACULEATUM).

POLYSTICHUM, *Roth. Schott*

Clusters of Spore-cases circular medial, rarely terminal on the venules, covered by an [illegible] or membranous scale. *Indusium* orbicular, peltate, *i.e.*, attached at or near its centre, the margin becoming free. *Veins* pinnato-furcate, *venules* direct, disunited at their extremities, the lower anterior one in each fascicle on the fertile parts of the frond bearing a sorus.

P. ACULEATUM fronds bipinnate, lanceolate or broad linear-lanceolate, rigid, pinnules distinct, and attached by their wedge-shaped base, or obliquely decurrent, or confluent, the anterior basal ones larger, all prickly serrate; sori infra-medial.

POLYSTICHUM ACULEATUM, *Roth, Flora Germanica*, iii. 79. *Deakin, Florigraphia Britannica*, iv. 91. *Babington, Manual of British Botany*, [illegible]. *Sowerby, Ferns*, 42. [illegible]. *Newman, History of British Ferns*, 169 (in part). *Moore, Handbook of British Ferns*, 86. *Presl, Tentamen Pteridographiae*, 83. *Fée, Genera Filicum*, 278.

[illegible] ACULEATUM, *Linnaeus, Species Plantarum*, 1552.

ASPIDIUM ACULEATUM, *Swartz, Schrader's Journal für die Botanik*, 1800, ii. 37. *Smith, Flora Britannica*, 1122. *English Botany*, [illegible] 1562. *English Flora*, iv. 27[illegible]. *Hooker and Arnott, British Flora*, 56[illegible]. *Willdenow, Species Plantarum*, v. 258. *Sprengel, Systema Vegetabilium*, iv. 105.

ASPIDIUM LOBATUM, *Schkuhr, Kryptogamische Gewächse*, 42, t. 40.

ASPIDIUM DISCRETUM, *Don, Prodromus Florae Nepalensis*.

Var. **LOBATUM** fronds narrow-lanceolate, very rigid, pinnules (except the larger basal ones) elliptic, not auricled, nearly all decurrent or confluent, prickly-serrate.

POLYSTICHUM LOBATUM, *Presl, Tentamen Pteridographiae*, 83. *Sowerby, Ferns*, 16.

POLYSTICHUM ACULEATUM, *Newman, History of British Ferns*, 169 (in part).

POLYSTICHUM ACULEATUM [illegible] *Deakin, Florigraphia Britannica*, iv. 91.

POLYSTICHUM ACULEATUM, γ. LOBATUM, *Deakin, Florigraphia Britannica*, iv. 91. *Moore, Handbook of British Ferns*, 86. [illegible] *Filicum*, 278.

POLYSTICHUM PLUKENETII, *De Candolle, Flore Française*, [illegible] 21.

ASPIDIUM LOBATUM, *Swartz, Schrader's Journal für die Botanik*, 1800, ii. 37. *Smith, Flora Britannica*, 1[illegible]. *English Botany*, [illegible] 1563. *English Flora*, iv. 278. *Hooker and Arnott, British Flora*, 565. *Mackay, Flora Hibernica*, 328. *Willdenow, Species Plantarum*, v. 260.

ASPIDIUM LOBATUM [illegible] *Hooker and Arnott, British Flora*, 568.

ASPIDIUM ACULEATUM, *Schkuhr, Kryptogamische Gewächse*, 4[illegible], t. 39.

ASPIDIUM PLUKENETII, *Steudel, Nomenclator Botanicus*, [illegible].

ASPIDIUM [illegible] *Sadler, Adumbratio Epiphyllospermarum Hungariae*, 6.

ASPIDIUM [illegible], *Sadler, De Filicibus veris Hungariae*, 51, (not of Kaulfuss).

ASPIDIUM [illegible] *Don, Prodromus Florae Nepalensis*, 1.

ASPIDIUM [illegible] *Wallich, Catalogue*, 360.

POLYPODIUM LOBATUM, *Hudson, Flora Anglica*, 459.

POLYPODIUM ACULEATUM, *Hudson, Flora Anglica*, 459. *Bolton, Filices Britannicae*, 4[illegible], t. [illegible].

POLYPODIUM PLUKENETII, *Loiseleur*, [illegible].

EXPLANATION OF THE PLATES.

PLATE X.—POLYSTICHUM ACULEATUM. **A**, from Norwood, Middlesex, *S. F. Gray*. **B**, P. ACULEATUM ARGUTUM, from Buckinghamshire. **C**, P. ACULEATUM ALATUM, from [illegible], Somersetshire, *Mrs. Archer Thompson*.

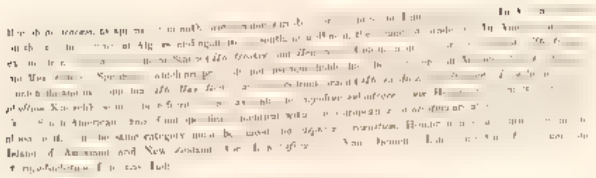
PLATE XI.—POLYSTICHUM ACULEATUM LOBATUM. **A** and **B**, from Norwood, Middlesex, *S. F. Gray*.

HABITAT.—A widely-dispersed and not uncommon plant in shady hedge-banks, and similarly sheltered situations. It is found all over England, Scotland and Wales, and in the majority of the counties, the [illegible] of the variety [illegible] showing an equally wide, if not wider range. The form [illegible] of Ireland also [illegible] we are not aware of its having been found in the Northern or Western [illegible]. It occurs at the sea level in the south-western parts of England, and in the form of *lobatum*, which seems the more common in Scotland, it ascends to upwards of 2000 feet in the Highlands.

GEOGRAPHICAL DISTRIBUTION.—This Fern appears to be found nearly over the whole of Europe, its occurrence being recorded from the Scandinavian Kingdoms through Central Europe to the Spanish Peninsula, but we are not aware of its occurrence in [illegible] or Turkey, although in the more alpine and [illegible] *P. Lonchitis* is found, [illegible] the presence of *P. aculeatum* is to be suspected. In Asia [illegible] the [illegible] from [illegible] and in various parts of British India (*Dr. Hooker* and *J. Smith*), the *Aspidium* [illegible] of Don and *A.* [illegible] of Wallich, not being distinguishable from the British *lobatum* and [illegible] *discretum* of Don being the same with the

THE COMMON PRICKLY SHIELD FERN

[illegible]



Caudex thick, tufted, erect or decumbent, becoming woody in age, consisting of the bases of [illegible] fronds closely surrounding a woody axis, slowly elongating, in the upper part scaly. *Scales* broad, ovato-lanceolate, numerous, dark fuscous. *Fibres* long, coarse, tortuous, branched, dark [illegible]

Stipes short, three to four inches long, densely scaly with broad ovato-lanceolate chaffy fuscous scales, terminal and adherent to the caudex.

Rachis stout, rounded behind, rounded and channelled in front, densely scaly, the [illegible] numerous and hair-like above, more numerous and intermixed with broader ones below, gradually merging in size with those of the stipes.

Vernation circinate, the main rachis becoming recurved before the unfolding of the frond is completed; the pinnæ convolute towards the main rachis.

Frond from one to three feet high, and from four to seven inches across, rigid, leathery, smooth and dark green above, paler beneath, more or less spreading, occasionally somewhat drooping, [illegible] in the typical form, narrowly-lanceolate in the variety, bipinnate. *Pinnæ* numerous, obliquely-lanceolate, broadest at the base, acuminate, pinnate at the base and for a part of their length, sometimes nearly to the apex, in other cases the basal pinnules only being distinct; the upper ones alternate, the lower ones nearly opposite and diminishing in size. *Pinnules* ovato-falcate or elliptic, acute and aristate at the apex; all or the basal ones only auriculate on the anterior side, the auricle acute and mucronate, aristate, subsessile, and attached by the wedge-shaped base, or decurrent; the basal portion entire and when distinct, obliquely incised on the posterior side, truncate on the side next the rachis; the rest of the margin toothed with unequal adpressed mucronate serratures. The basal anterior pinna on each pinnule is generally larger often much larger than the rest, and more strongly auricled, and the pinnules are all more or less convex; on the under surface are scattered fine hair-like scales. The typical form has the pinnules mostly distinct, the variety has them mostly decurrent; [illegible] plants apparently resulting indifferently from youth and decrepitude, they are obsolete, the pinnæ being merely more or less deeply toothed, somewhat resembling those of *P. Lonchitis*; it is this imperfect condition of the plant which has been named *lonchitidioides*.

Venation of the pinnules consisting of a flexuous *midvein*, with alternate branches or *veins*, which are again furcately-branched alternately, the lower veins producing three or four, the upper two or three branches or *venules*, of which the lowest anterior one is soriferous. In the auriculate portion at the base, the vein is more prominent than in the upper portion, and gives off a greater number of [illegible] forked venules, some few of which on both sides may produce sori.

Fruct-fication on the back, and usually confined to the upper half of the frond. [illegible] seated much below the apices of the venules, in a line on each side of the midvein of the pinnules and also of the vein of the auricles; often crowded, sometimes becoming confluent; attached to the lowest anterior venule of the fascicle of veins, or, at the auriculate base, to the venules on either side the [illegible] but there also to the anterior branch if they are forked. *Indusium* membranaceous, orbicular, peltate and umbilicate. *Spore-cases* numerous, dark brown, roundish-obovate, stalked. *Spores* very slightly muriculate.

Duration. The caudex is perennial; the fronds are persistent through the winter and [illegible] summer, though sometimes damaged by severe frosts. The young fronds grow up in May.

A. Polystichum aculeatum.
B. P. aculeatum argutum. C. P. aculeatum alatum

P aculeatum is very difficult to distinguish from its near ally *P angulare*, and yet, viewing the British forms, they appear to be distinct. Indeed, were it otherwise, a series varying through every gradation from pinnate to tripinnate must be united, and all hope of defining a species would be at an end. While thus admitting the difficulty of discriminating between some forms of these species, and without presuming to lay down any infallible rule for effecting this object, we may point out how they may with tolerable certainty be known from each other, presuming that in the application and appreciation of the distinguishing peculiarities some general knowledge of the plants is desirable. 1. *P aculeatum* is a stouter, more erect, and altogether more rigid plant than *P. angulare*, which is normally lax and herbaceous, equally large or even larger in its size. 2. *P. aculeatum* has its pinnules either confluent or decurrent, in which cases there is no difficulty whatever in distinguishing it; or, when the pinnules are distinct, as in the most perfect plants, they are wedge-shaped at the base, the anterior side being truncate, and the posterior obliquely incised in straight lines, the two lines describing an acute angle by the apex of which they are attached to the rachis. In *P. angulare* the truncated anterior base has a more curved outline, and the two lines of the base describe a right angle or an obtuse angle, at the apex of which is a distinct slender petiole, by which they are attached. 3. *P aculeatum* has its sori medial, that is, attached at a point along the middle part of the venule; it is in fact nearer the base of the venule, i.e., the point of furcation, than the apex, which is carried out to the margin of the pinnule. In *P. angulare* the fertile venule stops about midway across the pinnule, and the sorus is commonly placed at or almost close to its apex. These peculiarities observed in connection with each other will serve to reduce the dubious forms within very narrow limits indeed, at least, so far as British examples are concerned. The portion rather below the middle of the frond should be taken for examination.

This is one of the most easily cultivated of all the larger hardy ferns. It prefers a loamy soil and partial shade, and is increased readily by division. Being evergreen, its varieties are among the most desirable of our native species for the decoration of shady walks and rockeries, in which latter situation especially, where the roots are generally well drained, provided the plants are not exposed to the effects of severe drought and are moderately shaded, they thrive admirably. It is also very manageable as a pot plant, and under any circumstances is ornamental in its character. The smaller form, known as *lobatum*, is perhaps the most suitable for pot culture, on account of its size and the elegance of its fronds, which not uncommonly assume a very graceful lateral curve.

The allied *P Lonchitis*, though a vigorous looking and hardy plant in its native haunts, is seldom seen to preserve its vigour under cultivation, at least in the neighbourhood of London, probably on account of the impossibility of imitating the pure atmosphere of its native mountains. It certainly prefers a damp atmosphere, and, provided the moisture is not stagnant, its roots too should be freely supplied, they should in fact be constantly moist with percolating moisture, and hence the necessity of a careful mechanical adjustment of the materials employed as compost, of which mellow loam, gritty sand, and small masses of some porous body, such as soft sandstone, should be the main ingredients. We have succeeded tolerably well by potting the plants very firmly in such a compost with a small proportion of peat added, the plants being kept under glass in a close cold shaded frame, but the removal of the plants for the winter to a cold greenhouse where the atmosphere was drier, led to the partial decay of the fronds. The same plants however on being enclosed within a hand-glass, where consequently the atmospheric moisture was more abundant and regular, grew vigorously: so that we have no doubt the requirements of this species are a well moistened but freely-drained soil and a damp atmosphere, which can only be secured in many cases by keeping the plants close under glass. Propagation is readily to be effected by division, lateral crowns being seldom produced; consequently, plants generally have to be obtained from their native habitats. As it fructifies freely, they might be raised from the spores.

There are various degrees of development in this species, some of the most distinct of which have

been considered as varieties, and one at least of them (*lobatum*) distinguished as a species [illegible] authors.

1. *lonchitidioides*: this is usually considered as the young state of the form called *lobatum*. We are by no means certain that this view is correct, for no doubt very old roots, as was [illegible] out to us by Mr Bennett, have been found producing the lonchitiform fronds. It would rather seem to be the debilitated and partially developed condition of *lobatum*, whether caused by age or starvation or any other depressing influence. It is certainly not permanently distinct from *lobatum*, but interchangeable with it, for cultivated plants of *lonchitidioides* may be nurtured into *lobatum* proper, and *lobatum* proper may be starved into *lonchitidioides*. The plant so named is dwarf, simply pinnate, often very much resembling *P. Lonchitis*, but less spiny, not [illegible] with a greater or less tendency to become lobed. It is a fertile state.

2. *lobatum*: this variety, which is the fully developed condition of the previous one, has narrow lance-shaped fronds, one to two feet long, and subbipinnate, i.e. a few only of the pinnules are developed; the anterior basal one is always distinct, considerably enlarged, and strongly [illegible] but the [illegible] either decurrent or confluent, and not auricled. Between it and the type of the species, which is broader and in which most of the pinnules should be distinct and [illegible] is to be found every grade of [illegible] but yet our experience does not tend to the conclusion that the form called *lobatum* can be developed into *aculeatum* by culture, but on the contrary, that it is a permanent variety of which various gradations exist. It is a common plant.

3. *multifidum*: this Mr Wollaston describes as having the apex of the frond multifid, and the pinnæ occasionally dichotomous.

4. *proliferum*: another of Mr Wollaston's varieties; it produces bulbils in the axils of the lower pinnæ.

5. *argutum*: this has a broad lanceolate frond, with distinct pinnules as in the typal plant, and differs in the form of the pinnules, which are narrowed and elongated; they terminate [illegible] point, and have long spines to the marginal teeth. It was given to us by Mr Lloyd, with the information that it had been gathered in some part of Buckinghamshire.

The variety *obtusum*, mentioned in the *Handbook of British Ferns* (2 ed., p. [illegible]) as being cultivated in the Royal Botanic Garden at Kew, cannot be distinctly traced as a British plant, and is consequently omitted. It appears from specimens in Sir W. Hooker's and Mr Heward's herbaria, to be a North American form of the species, and it is therefore not improbable that the Kew plant may be of transatlantic origin.

Polystichum aculeatum lobatum.

PLATES XII. AND XIII

THE SOFT PRICKLY SHIELD FERN

(POLYSTICHUM ANGULARE).

POLYSTICHUM, *Roth. Schott*

Clusters of Spore-cases circular, medial, rarely terminal on the venules, covered by an indusium, or membranous scale. *Indusium* orbicular, peltate, i.e., attached at or near its centre, the margin becoming free. *Veins* pinnato-furcate, *venules* erect, discontinued at their extremities, the lower anterior one in each fascicle, on the fertile parts of the frond, bearing a sorus

P. ANGULARE fronds bipinnate, lanceolate, lax, pinnules distinct, acute or obtuse, herbaceous, with an obtuse-angled base, and attached by a distinct stalk, lobed or serrated, the serratures tipped with a soft bristle, sori terminal or subterminal

POLYSTICHUM ANGULARE, *Presl, Tentamen Pteridographiæ* 83 *Sowerby, Ferns*, 31. 15 *Moore Handbook of British Ferns*, 91 *Deakin, Florigraphia Britannica*, iv 93. *Babington, Manual of British Botany*. 412. *Newman, History of British Ferns*. 1.7 *Fée, Genera Filicum*, 278

POLYSTICHUM ACULEATUM, *A. Gray, Manual of the Botany of the Northern United States*. 632. *Fée, Genera Filicum* 278

POLYSTICHUM BRAUNII *Fée, Genera Filicum*. 278.

ASPIDIUM ANGULARE, *Kitaibel MS.* in *Willdenow, Species Plantarum*, v. 257 *Smith, English Flora*, iv 278 *Sowerby, Supplement to English Botany*, t. 2776. *Hooker and Arnott, British Flora*, 603. *Mackay, Flora Hibernica*, 330

ASPIDIUM ACULEATUM, *Kunze, Flora*, 1848 (excl. various synonyms)

ASPIDIUM [illegible] *Smith, Flora Britannica*. 1 [illegible].

ASPIDIUM [illegible] BRAUN *Döll, Rheinische Flora*, 21

ASPIDIUM BRAUNII, *Spenner, Flora Friburgensis* [illegible]

ASPIDIUM HASTULATUM, *Tenore, Semina H. R. Neap. pro anno* 1830 *Flora Napolitana*, iv. 130; v. 301 [illegible]

POLYPODIUM [illegible] *Forskal, Flora Ægyptiaco-arabica* 185.

POLYPODIUM APPENDICULATUM, *Hoffmann, Deutschlands Flora*, ii. 8 (not Swartz)

POLYPODIUM ANGULARE *Lowe, Novitiæ Floræ Maderensis* [illegible] 20 according to Kunze

POLYPODIUM [illegible] *Lindsay, Flora Anglica*, 4[illegible]9.

[illegible] *Bory, Expédition de Morée* 286 according to Kunze

Var. **IMBRICATUM** fronds linear-lanceolate, pinnæ short bluntish; pinnules roundish oblong imbricated

Var. **ALATUM**: fronds lanceolate rather small, pinnules decurrent with the winged secondary rachides, teeth rounded bristle-pointed (Plate X. fig. C.)

Var. **PROLIFERUM** fronds lanceolate, lax, bi- or tri-pinnate, pinnules narrow, attenuated strictly stalked, usually deeply lobed, with the lobes widely separated proliferous on the rachis

Var. **TRIPINNATUM** fronds ample lanceolate, pinnæ crowded, pinnules imbricated, the anterior basal one much elongated, distinctly pinnate the greater part of its length, its pinnulets stalked

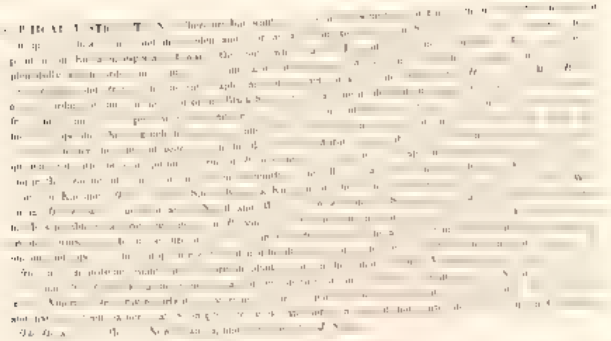
EXPLANATION OF THE PLATES.

PLATE XI[illegible] POLYSTICHUM ANGULARE A from St Martha's Hill, Surrey *T M* **B.** POLYSTICHUM ANGULARE [illegible] from St Martha's Hill, Surrey *T M* **C** POLYSTICHUM ANGULARE [illegible] from [illegible] Somersetshire *C Elworthy* **D,** POLYSTICHUM ANGULARE [illegible] from near [illegible] Middlesex *S. F. Gray*. **E,** POLYSTICHUM ANGULARE [illegible] from Nettlecombe, Somersetshire, *C. Elworthy*

PLATE XI[illegible] POLYSTICHUM ANGULARE [illegible] from St Martha's Hill, Surrey *T M* **B.** POLYSTICHUM ANGULARE TRIPINNATUM from Penzance, Cornwall, *E J. Lowe*. **C,** POLYSTICHUM ANGULARE PROLIFERUM (young), cultivated, *Royal Botanic Gardens Kew*

HABITAT—This very beautiful Fern, which delights in shady wooded places, is much less generally distributed than *P. aculeatum*, though probably more common than it in the south of England and in Ireland. It appears [illegible] over the whole of England and Wales in greater or less abundance and there are [illegible] records of its occurrence in Scotland [illegible] in Argyleshire, from which latter county we have seen [illegible] by Mr. A. Sim. In Ireland it is reported from [illegible] the province [illegible] [illegible] feet

THE SOFT PRICKLY SHIELD FERN



E PRINTING.

A. Polystichum angulare.

B. P. angulare hastulatum. C. P. angulare irregulare. D. P. angulare biserratum. E. P. angulare imbricatum.

PRINTING.

A. Polystichum angulare subtripinnatum.

B. P. angulare tripinnatum. C. P. angulare proliferum.

Fructification on the back of the frond, generally occupying the whole of the upper part to the extent of two-thirds, but sometimes confined on this portion to the upper part of the pinnæ. *Sori* small, numerous, round, indusiate, seated at the apex of the venule, forming a line on each side of the midvein, and also of the vein of the auricle, often crowded, and sometimes becoming confluent; they are attached to the anterior venules of the fascicle, whenever the veins are forked, but in the auricle several of the simple venules bear sori. *Indusium* firm, membranaceous, orbicular, peltate, and umbilicate. *Spore-cases* numerous, brown, roundish, obovate. *Spores* roundish, ovate, muriculate.

Although as regards *P. angulare* and *P. aculeatum* there is so close an affinity, that instances do occur in which it is difficult to determine between them, yet, confining our view to the plants as found in Great Britain such instances are rare, at least to those who have made themselves familiar with the aspect and characteristics of the plants. As to the application of the names, there is doubtless a certain amount of error and confusion, which it is hoped the autographic delineations in Plates X., XI., XII., and XIII., may assist in correcting. Extending the inquiry, however, so as to include the exotic Ferns of this affinity, the limits of the species become obscure, and it is perhaps doubtful whether in this more comprehensive view they can be defined,—at least by means of the mutilated examples alone available for examination in herbaria,—with sufficient clearness to be kept permanently separate. The study of the living plants may, indeed, afford other distinctive marks than those derived from form and texture, as in the case of *Polypodium Dryopteris* and its ally, which have a different vernation, and in that of some forms of *Lastrea Filix-mas*, in which the same kind of organic difference occurs. With our present information, however, there seems no mean between the two extremes of uniting the simply pinnate *P. Lonchitis* with the tripinnate *P. angulare*, an unbroken series being traceable; or, on the other hand, retaining the three British species we have figured (Plates IX., X., and XII.), as well as some of the allied exotic ones, as distinct. We are not prepared to accept the former alternative, and therefore, with all its difficulties, prefer the latter.

The specific name of *angulare*, which has been generally employed whenever the species has been kept distinct, is retained for this plant, from a suspicion that it may, after all, be found necessary to merge it in *P. aculeatum*, in which case any present change would be impolitic. We have no doubt, however, that both the *P. setiferum* of Forskal (1775) and the *Polypodium appendiculatum* of Hoffmann (1795) are referrible here, and these names certainly claim priority over *angulare* (1810). The law of priority, which should take effect if our plant should finally prove distinct, would give the name of *P. setiferum*, which is a remarkably suitable one.

The differences between the English *P. angulare* and *P. aculeatum* have been already pointed out. (See Plate X.)

In the garden, this Fern will be found very ornamental, and of very easy management. It grows readily in free sandy loam, either in shady parts of the garden or shrubbery, on rock work, or in the in-door Fernery, and it is increased with tolerable facility by division. Some of the varieties, however, propagate much more extensively by means of buds which form either at the base of the stipes below or about the surface of the soil, or in the axils of the lower pinnæ, or in some instances on the veins of the fronds. This remarkable proliferous or viviparous character has now been observed in several of the British Ferns, including *Polystichum Lonchitis*, *P. aculeatum*, with its variety *lobatum*, *P. angulare* three or four varieties, *Lastrea Filix-mas*, two varieties, *L. fœniseca*, *Asplenium lanceolatum*, *A. Ruta-muraria*, *Scolopendrium vulgare*, several varieties, and *Blechnum Spicant*. Besides this bulbiform mode of increase, Mr Wollaston has observed a different kind of development in a variety of *Polypodium vulgare* nearly allied to *cambricum*, communicated by Mr E. T. Bennett. In this case the development consisted of proliferous growths on the apices of the serratures of the leaves, which had every indication of being fertile, though unfortunately the frond was broken off before they were observed so

last their vital energy could not be tested. Although among exotic Ferns instances of viviparous growth were known to occur frequently, yet our acquaintance with so many bulbil-bearing British Ferns is due to the scrutiny of a few zealous cultivators, especially Mr Wollaston of Chiswick, Dr Allman of Bayswater, Mr Clapham of Scarborough, and Mr Baxter of Oxford, during the summer of 1854, for in the most recent publication on the subject, issued in the earlier part of the same year, Mr Newman has but one British species only *P. angulare*, as known to possess this property. Mr Baxter has suggested that it may be a result of pot-culture, all the instances in which it has been observed, having been on potted plants. The facts thus observed appear to afford additional evidence that the fronds of Ferns are not leaves, as some would call them, but to which the fact of their normally bearing the fructification seems repugnant, but that they at least include something of the nature of stems also. Another fact which militates against the opinion that the fronds of Ferns are mere leaves is this. Leaves, it is maintained by physiologists, have their points first formed, the perfected apex being pushed forward by accretion from below; but in the fronds of Ferns it may often be seen demonstration that the lower parts are perfectly developed and bear mature sori, whilst the apex is still unrolling, this is very obvious in the genus *Aspidium*, &c.

Polystichum angulare is one of the Ferns which exhibits a considerable degree of variation, the differences in some instances being very marked. Mr Wollaston has furnished us with the greater portion of the following enumeration of varieties.

1. *lastilatum* (M). This is a small pinnated form, quite like the Italian *lastreoides* of Tenore, as figured in the *Flora Napolitana*. It is chiefly remarkable for the small size of the pinnules and for their distinct and slender footstalk; the auricle, too, is very distinct, acute, and the lowest of the lower pinnules is separated by a deep incision from the rest of the pinna. It grows on St Martha's Hill in Surrey and probably occurs elsewhere.

2. *aculeatum* (W.). This form has the pinnules acute, and very distinctly stalked, but the pinnæ are longer than in the last, rather narrow falcate, and strongly serrated; the serratures are also slightly developed but the apices of both the pinnules and serratures are aristate. In appearance it somewhat approaches *P. aculeatum*. It is rather local than uncommon in Sussex, Hampshire, and probably other counties.

3. *aristatum* (W.). This, although not unlike the normal state of the species in its form and habit, differs in having the points of the serratures aristate, and the long hair-like points stand forward in a remarkable way giving the plant a bristly appearance. It is, moreover, very prolific in bulbils on the stipes, either beneath or at the surface of the ground. It was found by Mr Wollaston in Sussex, in 1854, and retains its peculiarities in the fronds of 1855.

4. *multifidum* (W.) has the apex of the frond beautifully tufted and the pinnæ sometimes divided. It is, perhaps, rather an occasional variation than a permanent variety.

5. *proliferum* (W.). There are two slight modifications of this variety, one of which and the [illegible] have been found at Wimbledon, Surrey, by Mr Chowles (though we have specimens from Mr [illegible] purporting to be from Devonshire, on the authority of Mr Chowles, and suspect this to be the habitat), the other was found recently near Otterey St. Mary in Devonshire by Mr Wollaston. It is a more lax and elegant plant. Both forms are prolific, bearing small bulbils chiefly at the junction of the pinnæ with the rachis, but sometimes in the axils of the pinnules. It is a [illegible] plant under cultivation. When perfectly developed, especially in Mr. Wollaston's plant, it is tripinnate, the pinnules, which are narrowed and attenuated as well as [illegible] deeply cleft, and the lobes so much separated as to become pinnulets. When less completely [illegible] remarkable for [illegible] pinnules. Both the forms [illegible] normal state. It is [illegible] the occasion of the [illegible] *Ferns*, but for the sake of securing as far as practicable uniformity of nomenclature [illegible]

spondent varieties of different species, the more characteristic name of *proliferum* which has been suggested, is here adopted

6. *depauperatum* (W.). This very rare and curious variety was found by Dr Kinahan in Ireland in 1852, and has since proved more or less constant under cultivation. Its fronds are frequently so depauperated that they become mere skeletons, with little but the ribs and veins remaining. Occasionally a frond is produced either entirely or partially like the normal form. It is, as far as is known, barren, and sometimes produces bulbils. Dr Kinahan had called this form both *lacinatum* and *strictum*.

7. *intermedium* (W.). This, a robust, fleshy-looking, upright-growing plant, so nearly approaches *P. aculeatum* that it is scarcely distinguishable from it. The fronds are occasionally multifid. The pinnules are crowded and overlapping; subtrapeziform from the unusual development of the anterior side, the margin is deeply incise-serrate, the basal anterior lobe being very much enlarged, and all the segments biserrate, and more aristate than is usual. The fronds are frequently abrupt at the apex, and when so have a tendency to produce bulbils. It was found by Mr R. Sim, near St. Mary's Cray, Kent, and is not common.

8. *praemorsum* (A.). Although this form has never attained maturity, it is too remarkable not to be noticed here. The whole plant appears of small growth, the pinnæ are lacinate and irregular, the pinnules truncate, marginate, and verrucose. It was found in Ireland by Dr Allchin in 1853.

9. *dissimile* (M.). This plant resembles the variety *intermedium*, in having the segments of its pinnules biserrate and more aristate than usual, and it is also proliferous, but it differs from it in having its fronds frequently depauperated, the pinnæ irregularly truncate or multifid, and the pinnules very irregular in size and shape. It has also a remarkably hispid aspect, arising both from the acumination of its serratures, and the narrowness of the scales with which it is profusely covered. It was found in Kent by Mrs. Delves, and is uncommon.

10. *irregulare* (M.). This was found near Nettlecombe, in Somersetshire, in 1854, by Mr Elworthy, gardener to Sir W. C. Trevelyan, Bart. It is a very curious form. The lower pinnæ, which are the most perfect in outline, bear varying and unequally incise-lobate pinnules, of which the basal anterior lobe forming the auricle is much enlarged, and considerably detached from the rest, and the rest form lacerate serratures, all the larger of which are again serrated. The upper pinnæ are fertile, more or less depauperated, and much more irregular in size, outline, and toothing.

11. *biserratum* (M.). This is a lax form with large broad pinnules, stalked, incise-serrate, the basal anterior lobe separated by a deeper incision, the rest biserrate and aristate. It would appear to have frequently a very long stipes. It was found by Mr S. F. Gray, near Brentford, and the same form seems to be common in Jersey, whence we have received it from Dr Allchin and Mr C. Jackson.

12. *alatum* (M.). The remarkable peculiarity of this variety is that the pinnules are connected by a very obvious wing on both sides the secondary rachides, on which they are decurrent. The pinnules are more tapered than usual, with the anterior side most developed, and the margin cut into rounded teeth tipped by a bristle, the under surface is also densely covered with hair-like scales. The fronds are about a foot high. It was found in Somersetshire by Mrs. Archer Thompson.

13. *imbricatum* (M.). This graceful and curious variety is so unlike all other known forms, that had more than a solitary plant been found, it ought, perhaps, to have taken rank as a species. It is perfectly distinct from all others. The frond is nearly two feet high, of linear-lanceolate outline, in this respect and in habit, resembling the *Polystichum lobatum* of authors, though having all the important characters of *P. angulare*. The pinnæ are short, linear, bluntish at their apices, often standing nearly at a right angle with the rachis. The pinnules are crowded and imbricated, roundish oblong, scarcely narrowed at the apex, but strongly spinulose-serrate, auricled at the anterior base, and unequally serrate. The basal anterior pinnule is larger, and they are all connected with the rachis by a short somewhat winged petiole. Another remarkable peculiarity in this variety, is that most of the larger

fronds are accompanied by a young one on their inner side, these young ones being [illegible] from bulbils which are formed beneath the soil on the stipes of the [illegible] fronds. It was [illegible] in Somersetshire by Mr. Elworthy.

14. *incisum* (W.). This variety, of which there are two forms, is unique in the details of its parts. It is a large-growing plant. The pinnules are very d[illegible] a few on the lower portion of the frond, are simply divided as in the variety *subtripinnatum* but as they approach the apex they become more and more incised and irregularly laciniated or jagged; their segments are [illegible] serrated, those nearest the secondary rachis being somewhat pro[illegible] or auricled. The whole pinnule is [illegible]. The two plants referred to differ much in size, the one [illegible] Mr. Wollaston in Sussex [illegible] upwards of four feet in height, the other, found by Dr. Allchin also in Sussex [illegible] smaller growth. For the latter, Dr. Allchin had suggested the name of [illegible] a disruption of the epidermis on some of the pinnules, but the two [illegible] distinct [illegible].

15. *subtripinnatum* (M.). This is one of the more highly developed states of the species [illegible] the lower pinnules, the basal ones in particular, are so deeply pinnatifid that the segments [illegible] distinct, and sometimes quite so. It is of large growth. In other respects it resembles the normal type. It is common in Ireland, and, we believe, plentiful in England in damp shady situations. Our [illegible] this variety (see Plate XIII. fig. A), necessarily taken from a small frond [illegible] compound character which is better represented by the detached pinna.

16. *tripinnatum* (M.). This very beautiful and peculiar variety has been called *tri*[illegible] with the *subtripinnatum* just described, in consequence of its basal anterior pinnules [illegible] distinctly pinnate, though the plant is on the whole less divided than the Devon [illegible] *pro*[illegible] the Irish variety *decompositum*. The most remarkable peculiarity is the [illegible] elongation of the anterior basal pinnules, and their truly pinnate character, the little pinnulets being distinctly stalked. The other pinnules are highly developed, though less so than the [illegible] they are crowded and imbricated. It is profuse in the production of sori, and the [illegible] subulate scales. It was found in Cornwall by Mr. Millet, and was first made known to [illegible] by Mr. E. J. Lowe. It is a very marked aberration from the normal form, and [illegible].

17. *decompositum* (M.). This beautiful variety is by far the most compound [illegible] normal race of this species. The fronds are divided thus—first, pinnæ, then [illegible] lobes of pinnulets, and these latter are again serrated. The basal pinnules are tolerably [illegible] of *P*[illegible] [illegible] plant is of Irish origin [illegible] Dr. Allchin.

PLATES XIV. XV. XVI. XVII.

THE MALE FERN, OR COMMON BUCKLER FERN
(LASTREA FILIX-MAS).

LASTREA, *Presl.*

Clusters of Spore-cases circular, medial or subterminal on the venules, covered by an indusium, or membranous scale. *Indusium* reniform, *i.e.*, more or less regularly rotundate with a posterior notch; attached by the sinus or notch, the margin becoming free. *Veins* simple, forked, or pinnate; *venules* direct, disunited at their extremities.

L. **FILIX-MAS** fronds lanceolate sub-bipinnate or bipinnate, pinnæ linear tapering to the apex, pinnules oblong obtuse, serrate (principally at the apex), crenate or inciso-lobate at the margin, the basal ones more or less distinct, the upper confluent; serratures not spinulose, indusium convex, persistent, (and except in *abbreviata* and *pumila*) without marginal glands.

LASTREA FILIX-MAS, *Presl, Tentamen Pteridographiæ*, 76. *Babington, Manual of British Botany*, 410. *Sowerby, Ferns*, 19, t. 6. *Moore, Handbook of British Ferns*, 103. *Newman, History of British Ferns*, 2 ed., 197
POLYPODIUM FILIX-MAS, *Linnæus, Species Plantarum*, 1551. *Bolton, Filices Britannicæ*, 44. t. 24
POLYPODIUM NEMORALE, *Salisbury, Prodromus*, 403
ASPIDIUM FILIX-MAS, *Swartz, Schrader's Journal für die Botanik* 1800, ii. 38. *Smith, Flora Britannica*, 1127 *English Botany*, xxii. t. 1458 and xxxvi. t. 1949 (excl. text) *English Flora* iv. 275. *Schkuhr, Kryptogamische Gewächse*, 45 t. 44. *Hooker and Arnott, British Flora*, 583. *Mackay, Flora Hibernica*, 340 *Fée, Genera Filicum*, 291. *Willdenow, Species Plantarum*, v. 259. *Sprengel, Systema Vegetabilium*, iv. 105.
ASPIDIUM NEMORALE, *Gray, Natural Arrangement of British Plants*, 9
POLYSTICHUM FILIX-MAS, *Roth, Flora Germanica*, iii. 82. *De Candolle, Flore Française*, ii. 559.
DRYOPTERIS FILIX-MAS, *Schott, Genera Filicum* (with a plate). *Newman, History of British Ferns*, 184.
LOPHODIUM FILIX-MAS, *Newman, Appendix to Phytologist* 1851. xx.

Var. **INCISA**. fronds robust, bipinnate, pinnules pyramidately-oblong, acutish, deeply inciso-lobate, the lobes serrate, sori usually occupying nearly the whole pinnule

LASTREA FILIX-MAS, *var.* INCISA, *Moore, Phytologist*, 1848, 137; *Handbook of British Ferns*, 100. *Babington, Manual of British Botany*, 410.
LASTREA EROSA, *Deakin, Florigraphia Britannica*, iv. 101
LASTREA AFFINIS, *T. Moore, MS. in Herb.*
ASPIDIUM FILIX-MAS β. EROSUM, *Hooker and Arnott, British Flora*, 583 (excl. *Aspidium erosum*, Schkuhr, t. 45, according to the figure) *Döll, Rheinische Flora* 16.
ASPIDIUM DEPASTUM, *Schkuhr, Kryptogamische Gewächse*, t. 51 (monstrous).
ASPIDIUM AFFINE, *Fischer and Meyer, "Hohenack. Enum. Talysch.* 10." *Fée, Genera Filicum*, 29.
POLYPODIUM HELEOPTERIS, *Borkhausen, Römer's Archives für die Botanik*, i., p. 6, according to Kunze
POLYSTICHUM AFFINE, *Ledebour, Flora Rossica*, xiv. 515.
LOPHODIUM EROSUM *Newman, Appendix to Phytologist*, 1851 xxi
DRYOPTERIS AFFINIS, *Newman, History of British Ferns*, 187
DRYOPTERIS FILIX-MAS, *var.* AFFINIS, *Newman, History of British Ferns*, 187

Var. **PALEACEA** fronds sub-bipinnate, pinnules oblong truncately obtuse, serrate at the apex, with numerous hair-scales beneath, sori distinct, often small, confined to the lower part of the pinnules; margin of the indusium much inflected beneath the spore-cases, stipes and rachis shaggy with long tapering scales, usually of a lustrous golden-brown, those of the base broader

LASTREA FILIX-MAS, *var.* PALEACEA *Moore Handbook of British Ferns* 1853, 10
LASTREA FILIX-MAS, *var.* BORRERI *Johnson, in Sowerby's Ferns*, 2e.
LASTREA PALEACEA. *T. Moore, MS. in Herb*
LASTREA PATENTISSIMA. *Presl. Tentamen Pteridographiæ* 76.
ASPIDIUM PALEACEUM. *Don. Prodromus Floræ Nepalensis*, 1
ASPIDIUM PATENTISSIMUM, *Wallich, Catalogue*, 340 (scales darker)
ASPIDIUM DONIANUM, *Sprengel Systema Vegetabilium*, iv part 2 320
ASPIDIUM WALLICHIANUM *Sprengel, Systema Vegetabilium*, iv 104.
NEPHRODIUM AFFINE. *Lowe. Botanical Miscellany*, iii. t. 25 *Novitiæ Floræ Maderensis*, in *Transactions of Cambridge Philosophical Society*, vi. 527
DRYOPTERIS PATENTISSIMUM. *A. Braun "Flora* 1841 710." *Fée Genera Filicum*, 303
DRYOPTERIS BORRERI *Newman, History of British Ferns* (1854). 189.
DRYOPTERIS FILIX-MAS, *var.* BORRERI, *Newman History of British Ferns*, 189

Var. **ABBREVIATA** fronds dwarfish glandular, sub-bipinnate, the pinnæ concave, scarcely pinnate, pinnules large (comparatively) broad obtuse mostly decurrent.

unequally crenate or crenato-lobate, the lobes with blunt teeth; sori usually uniserial on each side the midrib of pinnæ; indusium fringed with glands.

[illegible] *Babington, Manual of British Botany* [illegible] *Ferns*, 21.
[illegible] *T. Moore, MS. in Herb.*
[illegible] *De Candolle, Flore Française* [illegible]
[illegible] *Newman, Appendix to Phytologist* [illegible]
[illegible] *History of British Ferns*, 102.
[illegible] *Newman, History of British Ferns* [illegible]

[illegible] **PUMILA** [illegible] pinnæ deflexed, concave; pinnules small, convex, mostly confluent, bluntly crenato-serrate; sori [illegible] confined to the *lowest* anterior venule of the [illegible] pinnules, and thus arranged in a single series on each side the midrib of the pinnæ; indusium somewhat inflected at the margin, and beaded with (? deciduous) short stalked glands.

[illegible] *T. Moore, MS. in Herb.*
[illegible]
[illegible]
[illegible]

EXPLANATION OF THE PLATES.

PLATE X [illegible] from Exeter [illegible] *R. [illegible]*
PLATE X [illegible] **A**, [illegible] Surrey. [illegible] **B**, [illegible] St. Martha [illegible]
[illegible] **A**, [illegible] CRISTATA, cultivated. *Mrs. Dukes.* **B**, [illegible] Worcestershire [illegible]
[illegible] **A**, [illegible] cultivated, *Chelsea Botanic* [illegible] **B**, [illegible] *Botanic* [illegible]

HABITAT. This is one of our most common and most widely dispersed Ferns [illegible]

GEOGRAPHICAL DISTRIBUTION. The Male Fern [illegible]

Caudex large, tufted, scaly, erect or decumbent, often in age becoming [illegible] consisting of the bases of the old fronds persistent around a woody axis from the apex of which [illegible] the growing fronds, which are thus terminal, and adherent. *Scales* like those [illegible] stipes. *Fibres* protruding from among the bases of the fronds at the lower part of [illegible] coarse, dark coloured, deeply penetrating.

Stipes short, stout, from three to six inches long, terete, slightly channelled in front, densely clothed with large scales of a narrow lanceolate attenuate outline, membranaceous chaffy texture and pale brown colour intermixed with smaller and shorter ones. *Rachis* clothed sparingly with small subulate scales.

Vernation circinate, the apex of the frond becoming liberated before the whole rachis [illegible] and at this stage bent downwards with a curve resembling that of a shepherd's crook.

RE PRINTING.

Lastrea Filix-mas.

PRINTING

Lastrea Filix mas incisa .

THE MALE FERN

Fronds averaging two or three feet in height, but varying from a foot to four or six feet, according to age, variety, and locality; they grow erectish, and when the crown is vertical are arranged in a circlet around it; they are herbaceous, smooth, of a lively rather deep green, somewhat paler beneath in outline broadly lanceolate with a gradually tapering apex, or sometimes oblong lanceolate with a sudden acumination at the apex, bipinnate. *Pinnæ* numerous, alternate or nearly opposite, linear gradually narrowing towards the apex, which is acute, the lower ones decreasing in length from about the middle of the frond, the lowermost measuring an inch or rather more in length in fronds of a foot and a half long, those about the middle being three or four inches long, the lower pinnæ are also more distant than those higher up. *Pinnules* at the base of the pinnæ distinct or slightly connected by a narrow wing to the rachis, notched on both sides at the base, but with a broad attachment, the first pair somewhat larger than the rest, which are generally attached by the entire width of their base with a very narrow sinus, and more or less combined, oblong obtuse, *i.e.*, of equal width throughout, with the apex rounded, slightly crenate or crenato-lobed at the margin, serrated principally around the blunt apex, the teeth acute but not spinulose

Venation of the pinnules consisting of a flexuous midvein bearing alternate branches or *veins* which are again branched once or twice, these secondary branches or *venules* extending nearly to the margin, each venule (or vein) itself if simple or the anterior branch if ramified, proceeding towards the point of one of the marginal serratures, just within which it terminates. The manner of ramifying, *i.e.* by what is called forking, which consists in the production of two branches both slightly and about equally diverging from the straight line. In the larger varieties there are more of these forkings than in the smaller

Fructification on the back of the frond, rarely extending more than half way down, and most copious on the upper third. *Sori* numerous distinct, roundish-reniform, in the normal form confined to the lower half of the pinnules, attached to the anterior venule at a short distance above its source, and much below its termination, thus being medial on the vein, and forming two short lines extending upwards from the base of the pinnæ, rather nearer the midvein than the margin. *Indusium* firm, convex, persistent, reniform, *i. e.*, roundish with a posterior notch, affixed by the notch or sinus, with an entire margin, *i.e.*, without marginal glands, (except in *pumila*, and *abbreviata*, which are probably distinct) and acquiring a grayish or leaden hue as the fructification becomes matured. *Spore-cases* reddish brown, obovate. *Spores* oblong, muriculate

Duration. The rhizome is perennial. Young fronds are produced about May which endure throughout the summer and autumn and until destroyed by severe frost.

This plant is the type of the modern genus *Lastrea*—consisting of indusiate free-veined dot-fruited Ferns, having the indusium reniform, *i. e.* round with a notch in the margin, forming a sinus by which it is affixed. The name *Lastrea* was first and long ago used by Bory for a sub-generic group, which, neither according to ancient or modern views could be held to have any value the name had consequently lapsed, but was revived by Presl for the group above indicated. There is no ground whatever for the arbitrary selection, which Mr Newman has made, of *L. Oreopteris*, as the plant to bear Bory's name, to the exclusion of all the other species now usually associated with it as he himself has indeed shown by quoting Bory's subgeneric character, the application of which to this plant was an original error of observation, or at least the result of imperfect observations. *Lastrea Oreopteris* does, in fact, much less accord with Bory's character than do the three Polypodies he associated with it Presl was therefore quite justified when in 1836 he revived Bory's name (altering it to *Lastrea*) for a proposed group which included two of Bory's five species—*Thelypteris* and *Oreopteris*,—the others being referrible to *Polypodium*, Presl's genus, as we have already remarked, is rather typified by the subject of our present plate, although it fairly includes the two species just mentioned We must here protest against the freak in which Mr Newman has indulged, of scattering among the British *Lastreas* three

nations generic names, with frivolous distinctions, to the perplexity of amateur, and the dissatisfaction of professional botanists.

The generic name *Dryopteris* was suggested by Schott for the Male Fern in 1834. There can be doubt that this is also the *Dryopteris* of Adanson. The botanical name-reformers of the beginning of the present century would have done well to have availed themselves of this name, but it is surely not too late now to revert to such antiquities. It has, however, been adopted for the whole group by Dr Asa Gray. Of the two names applied to these plants which have thus been supported by modern botanical authority we select that of *Lastrea*, which has been most widely adopted, and as avoiding much needless change. The old name of *Aspidium*, which some retain, and with which Roth's *Polystichum* is nearly equivalent and coeval, seems more properly applied to species having peltate indusia, as is suggested by Swartz himself who uses the terms peltate and umbilicate, before those of reniform and dimidiate, all however being included by him. These several names were judiciously distributed twenty years since—*Aspidium* to the netted-veined peltate Aspidieæ, *Polystichum* to the free-veined peltate Aspidieæ, and *Lastrea* to the free-veined reniform Aspidieæ, and no further change, at least for the British species, is now required.

When the species of *Lastrea* and *Polystichum* were included under *Aspidium* they bore the English name of Shield Fern. It is however objectionable to use the same English name for different genera, and as the old name of Shield Fern is more properly applied to the *Polystichums*, which are the most generous Aspidia, we have proposed in the *Handbook of British Ferns*, to use for the *Lastreas*, the equivalent name of Buckler Fern, which is here also adopted.

The common Male Fern cannot well be mistaken for any other native species. It has been formerly confounded with *L. crenata* but the two have no very close affinity, and the only resemblance occurs in a form of *Filix-mas*, not common, in which the lower pinnæ are triangular. The Incised variety is in some respects like *L. rigida*, but obviously different in many others.

The Incised Male Fern—L. Filix-mas incisa—(Plate XV.) is altogether a larger and more striking plant than the normal form, more robust, averaging three or four feet, and sometimes reaching six feet in height, with a stipes of five or six inches. The fronds in unfolding liberate the point, which becomes bent like the curve of a shepherd's crook, as in the common plant, they are distinctly bipinnate lanceolate, not contracting abruptly near the apex. The pinnæ are elongate, tapering gradually to the apex. The pinnules are somewhat less closely placed, the basal ones notched, often deeply, on each side their base, thus having a narrow attachment, elongately pyramidate-oblong, broadest at the base and with a narrowed though rounded apex, the rest more broadly attached, and more equal in width the margins more or less deeply incise-lobate, the lobes three to five-toothed. The venation is more highly developed, thus a vein is directed up the centre of each lobe, and this bears alternately several veinlets; but the sori are, notwithstanding, produced only on the anterior basal veinule of each fascicle, so that, as in the normal form, they are merged in a single line on each side the midvein commonly extending, however, much nearer to the apex of the pinnule. The indusium is here reniform as in the other, convex, entire, and persistent. The irregularly deformed monstrous leafy developments of this variety constitute the *Aspidium dilatatum* of Schkuhr. This variety is probably equally common with the type form, and appears as widely dispersed: it is certainly found in the south and south-western, the midland and the northern counties of England in Wales in the east and south-west of Scotland, in the Channel Isles, and about Kingstown, Dublin Ireland, whence it has been sent to us by R. Barrington, Esq. Our figure necessarily represents a small and therefore less characteristic specimen.

The Dwarf Male Fern—L. Filix-mas pumila—(Plate XVII.) is permanently smaller, and less developed than the normal plant. It usually grows from nine inches to a foot in height, and rarely when very vigorous, reaches the height of a foot and a half. The stipes is two to three inches long, the fronds lanceolate, pinnate, the pinnæ short, blunt-ish, and pinnatifid [illegible] or

ITING.

A. Lastrea Filix-mas cristata. B. L. Filix mas polydactyla.

lobes small, oblong-obtuse, obscurely crenated, convex, but recurved at the points so that the pinnæ are concave, the points of the pinnæ being also recurved, so that the frond itself is concave. The venation is comparatively simple; the midvein, which is carried up each lobe, produces veins of which the lower are once forked, the upper simple. In fronds of ordinary growth, scarcely any but the anterior branch of the lowest anterior vein in each lobe or pinnule bears a sorus, the sori then forming an almost simple line on each side the midrib of the pinnæ about even with the sinuses of the pinnules. When however the growth is very luxuriant, a few of the basal pinnules bear two, three, or four sori each, but even in these cases, the sori form two simple series for more than half the length of the pinnæ. The indusium is convex, reniform, persistent, and its margin is somewhat inflected beneath the spore-cases, and beaded with short-stalked deciduous, probably, glands. This rare Fern appears to have been brought from Snowdon, and has been recently found near Llyn Ogwen by Mr S O Gray. It seems really to offer specific differences, in its constantly small size, the direction of the pinnæ and pinnules, the peculiar distribution of the sori, the glandular inflected indusium, and in the important character of vernation. In the process of unrolling its fronds, nothing like the shepherd's crook form is seen, but the rachis gradually unrols from the base to the apex. It is also reproduced from the spores, although that alone is not evidence of its distinctness. On the other hand, the general form of the parts, and of the sori and indusia, agree with diminutive examples of the Male Fern. The fresh fronds are fragrant, in consequence no doubt of the presence of numerous small glands on their surface; the fragrance having something of the sweetness of Mignonette.

The Abbreviated Male Fern—L. FILIX-MAS ABBREVIATA—is one of the permanently smaller forms, and is probably specifically distinct; though the Dwarf Male Fern has many characters in common with it, and the two are perhaps forms of one subalpine species. The present is however a larger plant, with considerably larger, broader, and therefore coarser looking pinnules, and although they are to some extent recurved, yet they are by no means so fully nor so constantly so, as in *L. pumila*. This also has the fronds, at least while young, glandular and fragrant.

The Golden-scaled Male Fern—L. FILIX-MAS PALEACEA—(PLATE XVII.) differs from the normal form, most obviously in its colour which is a yellowish green, and in the abundance of the lustrous golden-tinted scales, which clothe its stipes and rachis, so densely that their rich colouring is always conspicuous, but most so on inspecting the back of the frond. The same plant seems to have attracted Mr Lowe's notice in Madeira, and that of Dr Wallich in the East Indies; and by its peculiar scaliness serves also to connect the common European *Filix-mas*, with some South American Ferns to which other names have been given. The outline of the frond, the pinnæ and the pinnules, is like that of the less developed forms of the common plant; that is, the fronds are broad lanceolate, the pinnæ pinnate only at their base, the pinnules oblong, obtuse, serrated at the apex, with a broad attachment. Mr Wollaston points out, that the rachis and midveins are more or less tinged with purple, but this also occurs sometimes in *incisa*. The sori are often, if not always, smaller and the indusium before maturity, and even when the spore-cases are ripening, has its margins very much inflected beneath them, so that, when reversed, it is seen to have the form of a little pouch, just in fact like that presented by one of the leaflets of *Cheilanthes lendigera*. In the common and incised forms of *Filix-mas*, the margin of the indusium is merely bent down straight, a little sloping outwards till it comes in contact with the surface of the pinnule. The plant appears not uncommon, but its range is not fully known. It is, in part, from the Indian forms of this plant—forms in which we can detect no difference except the darker colour of their scales, and their somewhat larger growth—that Prof. Braun has constituted his genus *Dichasium*, which is characterised by having 'biscutelloid' indusia, which are indusia of roundish outline with a sinus extending upwards beyond the centre, so that the lobes look like two flaps. We have ascertained from a careful examination of Dr Wallich's specimens that this appearance of the indusia is merely the result of age. In the younger and perfect state the indusium is round, convex, with a posterior notch or sinus, and very much inflected margins, just as

occurs in the British plant. As the spore-cases enlarge, they are unable to lift off the indusium, in consequence of its constricted margin, and the result is that the edge becomes split opposite the sorus. The indusium is then pushed up by the advancing spore-cases, the upper margin is apparently brought nearer the point of attachment, and the two halves assume the appearance which attracted the attention of Prof. Braun. Exactly the same structure of indusium occurs in the other species [illegible] to this supposed genus—a Columbian plant collected by Hartweg.

The culture of the Male Fern is not at all difficult. It may be [illegible] almost any kind of soil, the best being a sandy loam, moist, but not wet. [illegible] good effect about shady walks, in woods and wilderness scenery, and on shady rockwork. The variety *crista* is the most striking, where effect only and not variety, is the object. Potted plants require ample space, and should be plunged out-doors in winter. It is increased by division.

The following is an enumeration of the principal variations. For most of the memoranda we are indebted to Mr Wollaston, who, it is right to state, considers our varieties *pallescens* and *pseudo-mas* distinct species,* and refers the variety *crustata*—the most important of the whole in an ornamental point of view—as a variety to the former.

1. *pallescens* (M.) This variety, called *Borreri* by Mr Newman, and *pseudo-mas*, by Mr. Wollaston, is sub-bipinnate, the lower pinnules only being distinct, the pinnules are oblong, truncately-obtuse and serrated at the apex. It differs from the normal plant in being of a yellowish hue, somewhat glaucous beneath, and in having its stipes and rachis quite shaggy, with [illegible]. It also differs, as already mentioned, in having the purple ribs and veins, and in the [illegible] indusium being inflected beneath the spore-cases. It is a widely dispersed, and [illegible] uncommon form.

2. *multifida* (W.). This form of variation shows itself in the typical *Filix-mas* as well as in the golden-scaled type to which the present is referred. The peculiarities consist in the apex of the frond, and of more or fewer of the pinnæ being bifid or multifid; and the pinnæ [illegible] occasionally depauperated to a mere rib. It is not quite permanent under cultivation, but nearly so.

3. *crustata* (M.). This very beautiful aberration, also referrible to the [illegible] analogous in character to the *Athyrium Filix-femina* [illegible] beautiful. The apex of the frond and the apices of the pinnæ [illegible] beautifully and uniformly tufted or tasselled, the pinnæ are also sometimes [illegible] narrow rarely [illegible] tasselled. [illegible] Charleston, near St. Austell, in Cornwall. Other plants resembling [illegible] Devonshire and Staffordshire. Like all other permanent varieties, this is produced [illegible] almost without variation from the spores.†

4. *prolifera* (W.). This was raised from spores of the variety *crustata*, and resembles it in [illegible] tasselled, but it is much more crisped, as well as depauperated and laciniated, its chief peculiarity

* Mr. W. [illegible]

† [illegible]

TURE PRINTING.

A. Lastrea Filix-mas pumila. B. L. Filix mas paleacea.

consists in its bearing bulbils, generally on the *external* side of the stipes, near its junction with the tufted caudex. Probably in old plants the viviparous character will be more abundantly developed.

5. *dichotoma* (W.). This is a multifid variation of the normal *Filix-mas*, exactly corresponding in its peculiarities with the variety *multifida*, already noticed, in having the apex of the frond and of all or the greater part of the pinnæ two-cleft or many-cleft, the pinnæ occasionally depauperated. It is only sub-permanent. It differs from *multifida* &c., in the absence of the golden scales, and the other marks of the *paleacea* group.

6. *incisa* (M.). As already explained, this is a larger plant than the normal form, of which it is probably the full development. It is distinctly bipinnate, the pinnules elongate, narrowed upwards, and usually bearing sori nearly their whole length. It is a common and very ornamental plant, with an erect stately habit. A very large and handsome form of this variety, with the pinnules more distant, narrow and elongate than usual, as well as somewhat falcate, has been gathered in the Isle of Wight, by Mr. A. G. More and the Rev. W. H. Hawker.

7. *erosa* (W.). This, which is doubtless the *Aspidium deputum* of Schkuhr, is distinguished by the irregularly lacinate form of the pinnæ and pinnules, giving the appearance of having been nibbled by insects. It is occasionally multifid at the apices of the frond and pinnæ, but not uniformly so. It is fertile and sub-permanent.

8. *decorso-lobata* (M.). A large growing variation of the *incisa* group. The pinnules are oblong and obtuse, the basal ones with a narrow attachment, the margins of the basal ones are more or less incise-lobate, with the lobes serrated, and the lower posterior one much enlarged and forming a kind of auricle directed towards the main rachis, which is the chief peculiarity of the variety and occurs in various lesser degrees in most of the common states of this type. The rest of the pinnules are more or less incise-serrate. This is the variety "*spinosum*" of the earlier editions of Mr. Francis's *Analysis of British Ferns* (under *Aspidium*), but is not at all spinose. It appears to be common and to be in fact one of the two larger forms into which the species is commonly developed, the characteristics of the two being sometimes united in one plant. The Rev. W. A. Leighton appears to have first noticed the peculiar lobing, his specimens gathered twenty years since are from Bomere and Sutton in Shropshire, and from Anglesea. We have also seen specimens from Ballyvaughan in Ireland, Callander in Scotland, Bedale in Yorkshire, Black Park in Bucks, Maidstone and Cobham in Kent, Albury in Surrey, Epping in Essex, Lynn in Norfolk, as well as from Jersey and Guernsey.

9. *producta* (M.). This is a very striking variety, somewhat analogous to *incisa*, being like it a large growing plant, with fronds at least three feet long and ten inches broad, and also resembling it in the divided condition of the pinnules, which are however much more deeply divided. The frond is lanceolate, the lowest pair of pinnæ two inches and a half long, triangular acuminate, the next are more than four inches long, triangular elongate, being nearly two inches across the base, gradually tapering to a sharp elongated point, those in the upper part of the frond, though narrower at the base, are also triangular elongate, the base being broadest, though in the uppermost the sides become more nearly parallel. The pinnules throughout are elongated, deeply pinnatifid, and narrow upwards to the apex, their outline being that of a narrow cone or pyramid, thus, together with the deep and conspicuous lobing, gives to the plant a very distinct appearance. The basal pinnules, which are cut down more than half way to the midrib, have an attachment so narrow as to resemble a mere winged petiole; the rest, half way up the pinnæ, though adnate are attached by less than their whole width. The lobes of the pinnules are obscurely serrated at the end. The sori are confined to the upper third of the frond, and on the only frond we have seen have a manifest tendency to occupy rather the central than the basal portion of the pinnules: that is, they are distant from the base on those pinnules which occupy the lower half of the fertile pinnæ. This variety was found by the Rev. W. A. Leighton at Wrekin in Shropshire.

10. *triangularis* (M.). This form belongs to the *incisa* group, but has something of the aspect of

Lastrea cristata, being remarkable for its narrow stiff erectish fronds, and especially for the unequally triangular outline of a few of the lower pinnæ, the lowest pair especially, these having—as indeed the whole frond has—much more the outline met with in *L. spinulosa* than that which usually occurs in *L. Filix-mas*. The pinnules are longish and all but the basal ones adnate or decurrent, they are incise-serrate or lobed and they sometimes show the enlarged posterior basal lobe, which occurs in *decurso-lobata*. It has been found in several parts of Kent, from whence we are indebted for specimens to Dr Allchin.

11. *polydactyla* (M.). This is a tasselled form of *Filix-mas*, referrible to the *mesa* group. The pinnæ are not shortened as in the variety *cristata*, nor do they narrow much until quite close to the tassel which terminates each of them. The pinnules are incised, and the basal ones have a tendency to dilatation. The apex of the frond is more or less tufted. Here and there a frond has its apex more decidedly tasselled, and the pinnæ themselves more normal, merely indicating a tendency to division, while occasionally a frond is produced in which the tendency to laceration both in the pinnæ and pinnules is carried to excess, becoming grotesque. It was found at Bromsgrove, in Worcestershire, and was communicated by B. Maund, Esq.

12. *abbreviata* (Lasch.). This is a dwarf-growing form, seldom exceeding a foot in height, and its young fronds are glandular and fragrant. It is pinnate, the pinnæ scarcely again pinnate, the lowest pinnules only being sometimes separated, the remainder always decurrent, the points of the pinnules are turned upwards so that the upper surface of the pinnæ are concave. The pinnules are large for the size of the plant, broad, rounded at the apex, the margin unequally crenate, or crenato-lobate, the lobes having blunt obscure teeth. It is allied to the variety *pumila*, but differs in the larger size of its pinnules, which gives it a coarser aspect, and it is not so much recurved. The sori are for the most part uniserial on each side the midrib of the pinnæ, and have indusia which at least while fresh, are margined with glands, as in *pumila*. It is rare, having been found in the Snowdon and Lake districts, and at Ingleborough and Teesdale, and Wyck in Gloucestershire.

13. *pumila* (M.). This is a permanently small dwarf plant, remarkable among other characteristics for the recurving of the points of its pinnæ, and of its pinnules, which give to its upper surface a concave appearance. The pinnæ are blunt, rather deflexed, and scarcely ever more than deeply pinnatifid, the basal pinnules only being sometimes, but rarely, semi-detached. The pinnules or segments are small, oblong, obtuse, convex, and bear a single sorus near their base on the anterior side, the sori, therefore, forming a simple series along the pinnæ on each side their rachis or midrib. It is only when the plant is very luxuriant that two or three sori are borne on each of the basal pinnules, but even then not so as to disturb the general uniserial arrangement. The fronds are glandular, at least when young, and fragrant. Mr. Wollaston finds it sometimes dichotomously divided at the apex. It seems confined to North Wales, and to alpine localities.

14. *subintegra* (M.). This variety, which occurs in the late Mr Winch's herbarium, belonging to the Linnean society, is doubtless a form closely allied to *pumila* and *abbreviata*. As in them the fronds are glandular, dwarf and, merely pinnate, the pinnæ are short and very obtuse, pinnatifid half way down into blunt oblong lobes (not merely sinuated, as Mr Newman's figure indicates). The sori are large, and form a single line on each side the midvein, about equidistant from it and the margin. The frond has a very narrow lance-shaped outline. It is stated by Dr Johnstone to have been gathered, long since, in abundance, by the Rev J Laird, at Innis, in the county of Clare, Ireland.

PLATE XVIII

THE RIGID BUCKLER FERN (LASTREA RIGIDA).

LASTREA, *Presl.*

Clusters of Spore-cases circular medial or subterminal on the venules, covered by an indusium or membranous scale. *Indusium* reniform, *i.e.*, more or less regularly rotundate with a posterior notch, attached by the sinus or notch, the margin becoming free. *Veins* simple, forked or pinnate; *venules* direct, disunited at their extremities.

L. RIGIDA: fronds elongate triangular or lanceolate, bipinnate, glandular, pinnæ tapering to the apex, pinnules oblong, blunt, lobed, the segments broad rounded, two- to five-toothed, the teeth not spinulose, indusium convex, persistent, fringed with glands.

LASTREA RIGIDA, *Presl, Tentamen Pteridographiæ*, 77. *Babington, Manual of British Botany*, 111. *Sowerby, Ferns*, 22, t. 11. *Newman, History of British Ferns*, 2 ed., 191. *Moore, Handbook of British Ferns*, 111. *Drakin, Florigraphia Britannica*, v. 99.

POLYPODIUM RIGIDUM, *Hoffmann, Deutschlands Flora*, ii. 8.

POLYPODIUM FRAGRANS, *Villars, Histoire des Plantes du Dauphiné*, iii. 849; not of Linnæus or Hudson.

POLYPODIUM VULGARE, *Bellardi, Appendix ad Florum Pedemontanum*, 49.

POLYPODIUM LINDOTERIS, *Bockhausen, Römer's Archiv. für die Botanik*, 19; according to Weber and Mohr.

ASPIDIUM RIGIDUM, *Swartz, Schrader's Journal für die Botanik*, 1800, ii. 37. *Schkuhr, Kryptogamische Gewächse*, 40, 39. *Hooker, Supplement to English Botany*, t. 2724. *Hooker and Arnott, British Flora*, 609. *Willdenow, Species Plantarum*, v. 265. *Sprengel, Systema Vegetabilium*, v. 106.

ASPIDIUM FRAGRANS, *Gray, Natural Arrangement of British Plants*, 9; not of Swartz.

ASPIDIUM PALLIDUM, *Link, Filicum Species in Horto Berolinensi cultæ*, 107.

ASPIDIUM NEVADENSE, "*Boissier*" *Kunze, Index Filicum*, in Linnæa, xx. ii. 229.

ASPIDIUM BOOTTII, *Tuckerman*, according to Dr. A. Gray.

ASPIDIUM ARGUTUM, *Kaulfuss, Enumeratio Filicum*, 242.

NEPHRODIUM PALLIDUM, *Bory, Expédition de la Morée*, 287, 31.

POLYSTICHUM RIGIDUM, *De Candolle, Flora Française*, 3 ed., ii. 560.

POLYSTICHUM STRIGOSUM, *Roth, Flora Germanica*, iii. 86.

DRYOPTERIS RIGIDA, *A. Gray, Botany of the Northern United States*, 63.

LOPHODIUM RIGIDUM, *Newman, Appendix to Phytologist*, xxi. *History of British Ferns*, 176.

EXPLANATION OF THE PLATE.

PLATE XVIII. LASTREA RIGIDA, from Arnside Knot, Westmoreland. *T. Wilcke.*

HABITAT.—This is a local plant almost entirely confined, as far as regards the United Kingdoms, to a few limestone, craggy mountainous tracts, within a small area in the approximating portions of the counties of Westmoreland, Lancaster, and York. There is a record of a single plant having been found near Bath, where it has probably been planted, and Mr. Darby reports (*Phytologist*, v. 726) having found it quite established on a wall of clay slate overhung by trees, at Tewsley Hill, in the county of Louth, Ireland. In England, its elevation above the sea would appear to range between 1200 feet and 1500 feet, or thereabouts.

GEOGRAPHICAL DISTRIBUTION.—This Fern is spread over the middle and south of Europe. Besides England, and perhaps Ireland, it is found in France, Switzerland, Sardinia, Calabria, Sicily, Germany, Dalmatia, Croatia, Hungary, and in the Morea. It has been obtained from Mount Sipylos in Asia Minor (*Hb. Hooker*), and from Siberia. Kaulfuss's *Aspidium argutum* from California, is merely a larger and more developed form of the species. According to Dr. Asa Gray, *L. rigida* is found, though rarely, in Massachusetts, North America, where also it acquires a larger size and more developed character than it does in Europe.

Caudex thick, scaly, tufted, decumbent, formed of the bases of the decayed fronds closely surrounding a woody axis, to the apex of which the fronds are attached and adherent. *Scales* lanceolate attenuate, and linear-lanceolate, or subulate. *Fibres* long wiry branched, dark-coloured.

Stipes short, about one-third of the length of the entire frond, sometimes more, thickened at the base, glandular, densely clothed with long subulate or linear-lanceolate narrow-pointed, membranous, scales intermixed with broader ones, all of a reddish-brown colour; the scales become smaller and less abundant upwards. Rachis furnished with scattered hair-like scales; both primary and secondary rachides bearing numerous short-stalked translucent glands.

Venation circinate.

Frond from one to two feet high, firm, dull green, paler beneath, the surface sprinkled over while young with numerous minute spherical short-stalked almost sessile glands, which give it then a glaucous hue, not conspicuous in the dried plants and at the same time impart a slight but peculiar and agreeable fragrance when pressed or crushed. Lanceolate, usually elongately triangular, the lower pinnæ being somewhat the longest, and the rest gradually shortening to the apex, sometimes, however, the outline is lanceolate. *Pinnæ* alternate, the lowermost ones sometimes opposite, distinctly triangular, the middle ones more or less oblong with a tapering point, the uppermost narrowly triangular, sometimes tapering from the base upwards. *Pinnules* oblong or ovate-oblong truncate at the base, obtuse at the apex, the lower ones shortly stalked, the upper adnate, deeply pinnatifid, the lobes oblong notched, the upper with about two, the lower with about five teeth, which are acute but not spinulose.

Venation of the pinnules consisting of a sinuous midvein, branching alternately, so as to throw a vein into each lobe, each of these veins branches so as to produce a *venule* extending up towards each marginal tooth, but not reaching the margin. The lower anterior venule is fertile.

Fructification on the back of the frond, occupying about the upper half. *Sori* rather large, round, numerous and occupying the whole length of the pinnules, inconspicuous, medial on the basal anterior venules, forming a line on each side of and near to the midvein becoming crowded and often continuous over the whole central portion of the pinnules. *Indusium* lead-coloured, firm membranaceous, persistent, convex, reniform i.e. round with a posterior sinus by which it is affixed, glandular both on the surface and at the margin, with stalked glands. *Spore-cases* numerous, brown, obovate. *Spores* oblong, muricate.

Duration. The caudex is perennial. The fronds are annual, produced in spring and perishing in autumn.

This species may be known from those to which it is allied by several characteristics. The fronds are comparatively small, generally broadest at the base, always covered with minute glands, which give off a pleasant balsamic fragrance, often appreciable in the vicinity of the living plants during sunshine. The outline of the pinnules—bluntly oblong—different from that which occurs in any other native species, is most nearly approached by some states of the Incised Male-Fern, and the serratures, as in that species, are not at all spinulose or awn-tipped, but are short and merely acute, but from that it is distinguished by its size, its outline, its glandular surface, and its glandular-fringed indusium. It can hardly be mistaken for any other of the *Lastreæ*, nearly all the rest of which have spinulose serratures.

The culture of this Fern is very similar to that of the other larger growing kinds. It grows well in free well-drained loamy soil, and the fact of its range being almost if not quite confined to limestone mountains suggests that the use of limestone among the soil may be beneficial, though it is certainly not essential to success. It is of far more importance that the soil should be kept moderately moist, and should be of such a texture, as may at the same time prevent any accumulation of stagnant water. It is increased by separating the lateral crowns formed by the caudex. The latter is the better for being somewhat elevated above the soil in planting, for being decumbent in habit, it does not when planted deeply liberate its crown so readily as the more erect-habited species.

Mr. Wollaston notices a variation in which the fronds or the pinnæ are simply or multifidly divided at the apex, but it is not a constant variety.

Lastrea rigida.

PLATES XIX. XX.

THE CRESTED BUCKLER FERN (LASTREA CRISTATA).

LASTREA, *Presl*

Clusters of Spore-cases circular, medial or subterminal on the venules, covered by an indusium, or membranous scale. *Indusium* reniform, *i.e.*, more or less regularly rotundate with a posterior notch, attached by the sinus or notch, the margin becoming free. *Veins* simple, forked, or pinnate, *venules* direct, disunited at their extremities.

L. CRISTATA fronds erect, narrow linear-oblong, sub-bipinnate (or bipinnate), pinnæ short triangular with oblong pinnules or segments, which are nearly always connected at the base, crenato-serrate, or obscurely lobed, with aristate teeth, anterior and posterior basal pinnules on the lower pinnæ nearly equal, scales of the stipes ovate, pallid, scattered; indusium without marginal glands.

LASTREA CRISTATA, *Presl, Tentamen Pteridographiæ*, 77. *Denkin, Florigraphia Britannica*, iv. 107. *Moore, Handbook of British Ferns*, 1 5-5. *Babington, Manual of British Botany*, 416. *Newman, History of British Ferns*, 2 ed., 204. *Sowerby, Ferns*, 21, v. 10.

LASTREA CALLIPTERIS, *Newman, History of British Ferns*, 2 ed., 2.

POLYPODIUM CRISTATUM, *Linnæus, Species Plantarum*, 1554, according to the Linnæan Herbarium.

POLYPODIUM CALLIPTERIS, *Ehrhart, Beiträge zur Naturkunde*, iii. 77.

ASPIDIUM CRISTATUM, *Swartz, Schrader's Journal für die Botanik*, 1800, ii. 37. *Smith, English Botany*, xxx. i. 2125 (not xxx. ii. 1949). *English Flora*, iv. 276. *Hooker and Arnott, British Flora*, 509. *Schkuhr, Kryptogamische Gewächse*, 39, i. 37. *Willdenow, Species Plantarum*, v. 252. *Sprengel, Systema Vegetabilium*, iv. 104.

ASPIDIUM CRISTATUM B. CALLIPTERIS, *Pursh, Flora Americæ Septentrionalis*, 662. } A variety.

ASPIDIUM GOLDLENUM of some gardens, not of Hooker and Greville.

ASPIDIUM ANGUSTRIENSE, *Sprengel, Anleitung*, iii. 134. *Schkuhr, Kryptogamische Gewächse*, 41, 44. *Willdenow, Species Plantarum*, v. 267. *Sprengel, Systema Vegetabilium*, iv. 104. } A variety.

NEPHRODIUM CRISTATUM, *Michaux, Flora Borealis Americana*, ii. 269.

POLYSTICHUM CRISTATUM, *Roth, Flora Germanica*, iii. 84.

POLYSTICHUM CALLIPTERIS, *De Candolle, Flore Française*, 3 ed., 562.

DRYOPTERIS CRISTATA, *A. Gray, Manual of Botany of Northern United States*, 631.

LOPHODIUM CALLIPTERIS, *Newman, Phytologist*, iv. 37. *Appendix*, xix. *History of British Ferns*, 3 ed., 170.

Var **ULIGINOSA**: fronds various, early fertile ones tall, erect, narrow, linear-lanceolate bipinnate below, with oblong-acute, adnate, inciso-serrate, or lobed pinnules having aristate incurved teeth, barren ones shorter, with oblong bluntish pinnules, adnate or decurrent, later fertile ones broader, with oblong bluntish crenato-serrate pinnules, anterior and posterior basal pinnules of the lowest pinnæ nearly equal in size.

LASTREA CRISTATA B. ULIGINOSA, *Moore, Transactions of Botanical Society of Edinburgh*, iv. 109. *Phytologist*, iv. 149. *Handbook of British Ferns*, 1 ed. *Babington, Manual of British Botany*, 4 0.

LASTREA ULIGINOSA, *Newman, Phytologist*, ii. 379.

ASPIDIUM SPINULOSUM, *Hooker and Arnott, British Flora*, 6 ed. (in part).

ASPIDIUM SPINULOSUM, *var.* ULIGINOSUM, *A. Braun, Dölt, Rheinische Flora*, 17.

LOPHODIUM ULIGINOSUM, *Newman, Phytologist*, iv. 37. *Appendix*, xix. *History of British Ferns*, 163.

Var **SPINULOSA**: see LASTREA SPINULOSA (Plate XXI).

EXPLANATION OF THE PLATES.

PLATE XIX.—LASTREA CRISTATA, from Bawsey, Norfolk. *De Allchin.*

PLATE XX.—LASTREA CRISTATA ULIGINOSA, cultivated. (From Oxton Bog, Nottinghamshire, *J. Lloyd.*)

HABITAT. The plant which we regard as the type of this group is rare and local in this country. It occurs in boggy situations. Trustworthy records of its existence appear to be confined to the counties of Norfolk and Suffolk in the east, whence it stretches westward to those of Nottingham and Chester. Huntingdon and Staffordshire have also been reported, and are sufficiently probable, but these together with some other English as well as Scotch and Irish counties, either require confirmation or are altogether erroneous. The variety *uliginosa* occurs with *cristata* in Norfolk, Nottinghamshire, and Cheshire. It has also been reported from Epping, in Essex, on the authority of Mr. Newman, who should be familiar with it, but all the Essex examples we have seen under this name are of an undistinguishable form *spinulosa*. Mr. Watson estimates its range in altitude as extending from the sea level, to about 300 feet above it.

THE CRESTED BUCKLER FERN

GEOGRAPHICAL DISTRIBUTION. [illegible] Europe [illegible] Scandinavia [illegible] United States and Canada [illegible] North America [illegible] *Aspidium uliginosum* and [illegible] North West America [illegible] The variety [illegible] It has also been obtained from the Slave River in North West America [illegible] *uliginosa* occurs in Germany as well as in England.

Caudex stoutish, decumbent, or slowly creeping, *i. e.* extending in a horizontal direction, the fronds of each season being in advance of those of the preceding one, branched, scarcely tufted, somewhat scaly, formed of the enlarged living bases of the decayed fronds surrounding a woody axis. *Scales* similar to those of the stipes. *Fibres* numerous, coarse, dark brown, branched.

Stipes terminal and adherent to the caudex, about one-third of the entire length of the frond, stout shining, dark brown at the base, the brown blending with green upwards, sparsely scaly, with broad ovate membranous pale-brown scales, which are for the most part appressed, and are most numerous near the base. *Rachis* stout, channelled in front, almost free from scales, pale green.

Vernation circinate, the pinnæ lying flat against the sides of the incurved rachis.

Frond from one to three feet high, herbaceous, dull green, erect, narrow linear-oblong, tapering at the apex, scarcely at all narrowed at the base, sub-bipinnate. *Pinnæ* numerous, the lower ones distant, sub-opposite, broad triangular, two inches long, an inch and a half broad at the base, the upper more contiguous, alternate, elongate triangular, those near the middle of the frond measuring about two and a half inches long, and nearly an inch and a quarter broad at the base, all shortly stalked, the stalk twisted so that their upper surface is directed towards the apex of the frond. *Pinnules* oblong, obtuse, all more or less adnate, and connected by the wing of the rachis, the basal ones only, and those only on highly developed fronds, having a narrow attachment, pinnatifidly lobed, the lobes serrate, with spinulose teeth, the rest of the pinnules are inciso-crenate at the margin, serrate at the apex, the crenatures serrated, and all the serratures tipped by a spinulose point, the posterior basal pinnules are scarcely larger than the anterior ones of the same pinna. The late summer and autumnal fronds have broader and larger pinnules.

Venation of the pinnules consisting of a flexuous midvein, which throws off a vein into each lobe these veins bear several *venules*, which are either simple or forked, and are directed one towards each tooth, terminating within the margin in a somewhat thickened point. Usually only the anterior basal venule of each fascicle bears a sorus, but occasionally on the lowest pinnules the posterior basal venule also is fertile. The veins are conspicuously depressed on the upper surface.

Fructification on the back of the fronds, usually confined to the upper half, but sometimes extending lower down. *Sori* numerous, round, indusiate, medial on the anterior basal venules in a row on each side of and nearer to the midrib than the margin, except in the most luxuriant pinnules, where the development of sori on the posterior venules produces a more irregular arrangement. *Indusium* membranaceous, reniform, flat, with a wavy somewhat irregular margin but without glands, affixed by a deep basal sinus. *Spore-cases* numerous, dark brown, roundish. *Spores* oblong, muricate.

Duration. The caudex is perennial. The fronds are annual, the earliest produced in May succeeded by others during the summer, all destroyed by the autumnal frosts, or eventually perishing if not exposed.

Lastrea cristata, with the plants called *uliginosa* and *spinulosa*, form a group, distinguishable by habit and other characters from the allied *dilatata* group, with which, however, the more highly developed form, *spinulosa*, is sometimes associated by botanists of high authority, in consequence no doubt, of the plants having been studied in the herbarium, where their differences become less marked rather than in a state of growth, in which the most important characters are obvious. Of this group *L. cristata* is the least developed form. We have in the *Handbook of British Ferns* (see p. 114

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Lastrea cristata.

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Lastrea cristata uliginosa.

treated all three as forms of one species; and that they have a close natural affinity which separates them from the forms of *L. dilatata*, we have no doubt whatever, however similar to the latter in some cases, may be the degree and mode of division in the fronds. Their affinity is evidenced by marks far more important than those to be derived from such inconstant characters as are the outline or division of the fronds, namely, by the creeping caudex, by the sparse and pallid broad appressed scales, and by the erect narrow fronds, and entire indusia, in all which they agree. In these points they differ more or less obviously, and in the case of the first-named absolutely, from the *dilatata* group. Without at all disturbing the conviction which led us to regard these plants as varieties of one species, we however propose here, in deference to the more commonly received opinion, to treat of *L. spinulosa* separately.

The *Lastrea uliginosa* of Newman (PLATE XX.) we must still regard as a variety of *L. cristata*, the only marked difference, in truth, being that its earlier fertile fronds have the pinnules more acute, and more conspicuously lobed and toothed, and that the discrepancy in size between the anterior and posterior basal pinnules is a degree more manifest. It has a stout decumbent caudex, and erect linear-lanceolate fronds, two to four feet high, and bipinnate at the base of the pinnæ. Three kinds of fronds are borne by the plants, but they are not all simultaneous in their appearance, nor constantly produced; and though different they are not strikingly dissimilar like the barren and fertile fronds of some other Ferns. The early fronds of the stronger crowns are fertile and with them sometimes but not always appear others which are smaller and barren, the latter often produced from small lateral crowns, but also sometimes from the same crown which produces the fertile ones; whilst later in the season other fronds with broader and blunter pinnules are borne, these being sometimes fertile, sometimes barren. Thus, the early barren fronds are small, spreading, pinnate, with decurrent oblong obtuse pinnules, and resemble small barren fronds of *cristata*. The summer fronds are also *cristata*-like, large, with decurrent oblong obtuse pinnules, and very frequently fertile. The fertile fronds produced in spring are more like *spinulosa*; they grow quite erect, and are linear-lanceolate, bipinnate, the basal pinnules distinct, all the pinnæ stalked, and set on so that their upper surface is turned towards the point of the frond. The pinnæ are elongate triangular, the lower ones being shorter, broader, and more oblique, the first posterior pinnule being an inch, the anterior one three-fourths of an inch long. The basal pinnules of the middle pinnæ are distinct, oblong, acute, pinnatifidly lobed, the lobes sharply serrate with longish spinulose or aristate teeth; the upper pinnules are adnate and sharply and deeply serrate. The fructification extends over the whole frond, but is most copious towards the top, where it forms two lines near the midrib on the smaller pinnules, being confined to the anterior basal venules; whilst it becomes confused on the larger pinnules in consequence of being produced in two series on the lobes, both anterior and posterior venules being there fertile. The caudex branches sparingly. The fronds are said to appear several days earlier than those of *L. cristata*, but our cultivated plants have never shown any regularity in this respect, some plants preceding, others following *L. cristata*, although all circumstanced alike. We consider this plant more closely allied to *L. cristata* than to *L. spinulosa*, because its vernation agrees more exactly with the former, and because neither its early barren fronds nor its later fertile ones can be certainly distinguished from analogous fronds of *L. cristata*, whilst, on the other hand, no such *cristata*-like fronds are produced by *L. spinulosa*. The special attention of English botanists was drawn to this plant by Mr. John Lloyd, a few years since; and our figure is taken from a plant brought by him from Oxton bog, Nottinghamshire.

Both these Ferns grow readily in peaty soil, with abundant moisture; and though not remarkable for elegance, they are yet useful in grouping on account of their upright habit of growth. They are increased with tolerable facility by the separation of the lateral crowns when produced.

The species and variety produce occasional multifid variations. In both the variation consists mostly in the division of the apices of the pinnæ, rather than that of the apex of the frond, which is rarely affected. They however do not rank as permanent varieties.

PLATE XXI

THE NARROW PRICKLY-TOOTHED BUCKLER FERN

(LASTREA SPINULOSA).

LASTREA, *Presl.*

Clusters of Spore-cases circular medial or subterminal on the venules, covered by an indusium, or membranous scale. *Indusium* reniform, i.e., more or less regularly rotundate with a posterior notch, attached by the sinus or notch, the margin becoming free. *Veins* simple, forked, or pinnate; *venules* direct, disunited at their extremities.

L. SPINULOSA: fronds erect, narrow oblong-lanceolate, bipinnate; pinnæ elongate triangular oblique; pinnules oblong acute, inciso-serrate or pinnatifid with aristately toothed lobes; posterior basal pinnules of the lower pinnæ much larger than the anterior ones; scales of the stipes few, ovate, pallid; indusium without marginal glands.

LASTREA SPINULOSA, *Presl, Tentamen Pteridographiæ*, 76. *Babington, Manual of British Botany*, 410. *Sowerby, Ferns*, 21, 1[illegible].
LASTREA CRISTATA, *var.* [illegible] *Moore, Handbook of British Ferns*, 1[illegible]. (See also, *ante*, under Plate XIX.)
LASTREA DILATATA, *var.* [illegible] *Babington, Manual of British Botany*, 1 ed., 386 [illegible].
LASTREA [illegible] *Newman, Naturalist's Almanac* [illegible] 2. *Deakin, Florigraphia Britannica*, [illegible] 108.
POLYPODIUM SPINULOSUM, *Muller, Flora Fridrichsdalina*, [illegible] *Flora Danica*, [illegible] 12 [illegible] 707.
POLYPODIUM FILIX-[illegible] *Plantæ cryptogamicæ* [illegible].
ASPIDIUM SPINULOSUM, *Swartz, Synopsis Filicum*, 420. *Schkuhr, Kryptogamische Gewächse*, 48, t. 48 (excl. fig. [illegible]). *Sprengel, Systema Vegetabilium*, [illegible] (in part [illegible] indusium [illegible]).
POLYSTICHUM SPINULOSUM, *Roth, Flora Germanica*, [illegible].
[illegible] SPINULOSUM, *Newman, Phytologist*, [illegible] 371. *Appendix* [illegible] *History of British Ferns*, 157.

EXPLANATION OF THE PLATE.

PLATE XXI.—LASTREA SPINULOSA: **A**, from Black Park, Buckinghamshire, *Dr Allman*; **B**, from Wimbledon, Surrey, *S. F. Gray*; **C**, from Godstone, Surrey, [illegible].

HABITAT.—This species is common, and doubtless generally distributed, though not always well discriminated from *L. dilatata*; consequently its records [illegible]. It grows generally in damp [illegible] places, and occurs over the whole of England; specimens from the [illegible] (Thrington wood, Northumberland) [illegible] by the Rev. [illegible]. In Wales it seems less general, [illegible] in the eastern parts. In Scotland [illegible] and Ireland it is apparently rare. We have [illegible] found it at [illegible] Loch Lomond. Mr. [illegible] has communicated authentic specimens from [illegible] and we have been [illegible] others by Sir W. C. Trevelyan from near Braxton Castle, [illegible]. Mr. Newman records an Irish habitat at [illegible] on the authority of Mr. [illegible] it [illegible] has been reported also [illegible] on the authority of Mr. E. J. Lowe [illegible] Wicklow, and we have seen a [illegible] of what appears to be this plant from Newtown, Mount Kennedy in Wicklow, [illegible] Barrington, Esq. Its range in elevation appears to be [illegible] and not [illegible] 900 feet in England, [illegible] probably considerably more in Scotland.

GEOGRAPHICAL DISTRIBUTION.—The range of this fern [illegible] known, in consequence chiefly of the [illegible] which renders almost all the published statements [illegible] to which the [illegible] belong [illegible] of too many foreign specimens [illegible] impossible to [illegible] of information. It would appear [illegible] and [illegible] in France, [illegible] in Switzerland [illegible] of Germany [illegible]. We may also have [illegible] specimens from [illegible] the common American plant of this [illegible] *L. intermedia*.

Caudex stoutish, decumbent or slowly creeping in an horizontal direction, with the fronds growing erect from its apex; branched, sometimes more or less tufted slightly scaly, formed of the enlarged and enduring bases of the decayed fronds surrounding a woody axis. *Scales* resembling those of the stipes. *Fibres* coarse, numerous, branched, dark brown.

Stipes terminal and adherent to the caudex nearly as long as the leafy part of the frond, stoutish, dark brown-purple at the base, sparsely scaly, with broad-ovate membranous pale-brown scales of

which many become at length more or less appressed, the scales are most numerous near the base *Rachis* [illegible] scarcely at all scaly, pale green, smooth.

Vernation circinate, sometimes in this plant the rachis is simply circinate, but in other cases besides the ordinary involution, there is also a lateral curvature, the pinnæ and pinnules are all separately involute

Frond from two to four or five feet in height erect [illegible] yellowish green, narrow oblong-lanceolate tapering at the apex, bipinnate *Pinnæ* numerous, opposite or [illegible] from becoming more alternate above, the lower ones distant, obliquely triangular from the greater size of the posterior basal pinnule, in large specimens, two feet or upwards in height) about four inches in length, and three inches across the base, of which latter the posterior pinnules measure nearly two inches, the upper ones are less distant and narrower, of an elongate triangular outline, loose just above the middle measuring four and a half inches long, and barely two inches [illegible] at the base, where the posterior and anterior pinnules are of nearly equal size. The pinnæ are stalked, frequently more or less drooping, and often twisted so as to turn their upper surface towards the apex of the frond, but this peculiarity is less marked than in the allied *L. cristata* and its variety *Pinnules* oblong acute, broadest at the base, the lower ones with a short stalk-like attachment, the upper more or less adnate, the basal pinnules (of the pinnæ half-way up the fertile fronds) pinnatifid almost to the midrib, with oblong acute lobes, the lobes strongly serrated, with spinulose teeth whose points are directed towards the apex of the lobe, and often curved upwards above the plane of the surface of the lobe, the upper pinnules are either inciso-lobate with spinulosely serrate lobes, or coarsely serrate with spinulose teeth. The barren fronds usually, and some of the fertile ones, are broader and more lax in habit than those above described and sometimes entire plants assume this character

Venation of the pinnules (the basal ones of fertile pinnæ near the centre of the frond,) consisting of a stout midvein, from which a primary vein extends into each lobe, where it forms a flexuous secondary midvein, bearing alternate forked *veinlets* on the short anterior fork of which, nearly at its point, and stunning just beneath the sinus of the serrature, the sorus is placed, the sori then forming two rows along the lobes of the pinnules. In the less divided pinnules at the middle of the pinnæ, the primary midvein produces branched *veins*, and the anterior basal *vein* also in this case bears the sorus, near to its termination, so that the sori then form two lines along the pinnule itself. This latter being the structure of the greater number of pinnules, the general aspect of the fructification is to form two lines lengthwise on the pinnæ. The venules are directed one towards each serrature, but terminate before reaching it, in a thickened point

Fructification on the back of the frond usually occurring on the upper half, but sometimes extending over the whole surface. *Sori* numerous, round or hastate, medial or subterminal on the anterior basal venules, (or on several venules in the deeply pinnatifid basal pinnules,) forming a line on each side the lobe usually distinct, but often crowded. *Indusium* flat, reniform, membranous, persistent, with an [illegible] wavy or with angular projections, but without glands. *Spore-cases* brown, numerous, rotundate. *Spores* oblong, muricate

Duration. The caudex is perennial. The frond is semi-annual, the first growth appearing early in May and others growing up at intervals through the summer, they perish in autumn when exposed, but under shelter though decaying near the base of the stipes so as to be unable to stand erect they nevertheless retain much of their freshness through the winter and the extreme base of the stipes continues fresh for many years.

This plant is known from *L. dilatata*, by its creeping caudex, by the few broad pallid scales of its stipes, and by the absence of glands from the margin of its indusium. The connecting link between it and *L. dilatata* is the *L. glandulosa* of Newman, which latter, as far as our knowledge of it extends has neither the creeping caudex nor the entire indusium of *L. spinulosa*, and differs also in the

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Lastrea spinulosa.

abundant glands which cover it, though this latter is a character of comparatively little value, for common forms of *L. dilatata*, in no other respect distinguishable, are found both covered with and free from glands. *L. spinulosa* is less easily distinguished by the precise and important characters afforded by the caudex, the scales, and the indusia, from *L. cristata*, though perhaps more readily separated by the eye from that, than from imperfect specimens of *L. dilatata*, with which, in some of its forms it agrees in the variable, and therefore less important character of the subdivision of its parts. From *L. cristata* itself, *L. spinulosa* may be known, by the short triangular, and less divided pinnæ of the former, and by their blunter, less deeply toothed pinnules; but from the variety *dilatata* it is in some of its states much less easily known, the greater inequality of the pinnules on its lower pinnæ being almost the only difference, if we except the cristata-like fronds of *dilatata*—and the latter are not always present. Indeed so closely do these merge into each other by means of transition forms of frond, that we are forced to the conclusion that they are all three in reality mere variations from one specific type.

There are two versions of the specific name of this plant in use among British botanists—*spinosa* and *spinulosa*. We advisedly use the latter. The former has been revived by recent authors, on the grounds that Roth who employed it in *Flora Germanica* (1800), was the first to correctly define the plant from its ally *L. dilatata*, and that Müller in the *Flora Danica* has "misprinted" *spinulosa* for Weiss' name of *spinosa*, and under it figured the plant we now call *L. cristata*. Weiss' name *Polypodium Filix-fœmina* var. *spinosa*, as that of a variety merely, and altogether so incorrect, has no claim to notice. Müller describes, but without name, and very well figures, two pinnæ of *L. spinulosa* in the *Flora Fridrichsdalina* (1767), and his later figure in *Flora Danica* (1777), where he names it *Polypodium spinulosum*, is an exact representation of our *L. spinulosa*, and not of *L. cristata*. We therefore can neither subscribe to the assumption that Müller's name is a misprint, nor can we allow the claim made on behalf of Weiss' name, which Müller has by many years the precedence over Roth. Equally, as we believe, are those writers in error, who deny that this plant is the *Lastrea spinulosa* of Presl. *Aspidium spinulosum* as defined by Swartz in his *Synopsis Filicum* (p. 420) is the plant of Müller's figures, and Swartz moreover quotes Sowerby's t. 48, which admirably depicts *L. spinulosa*, excepting in the detached figures of indusia, *d* and *e*, these latter being evidently erroneous, for glandular indusia have, we believe, never been found on the true *spinulosa*, which the figure otherwise so perfectly represents, that it must be *L. spinulosa* and cannot be *L. dilatata*. Swartz's plant, therefore we maintain, is *L. spinulosa* (our PLATE XXI.), not *L. dilatata*, and Presl's is simply Swartz's with a new generic name. We thus arrive at the conclusion, that our English plant, the most divided of the three forms we refer to *L. cristata*, is the *L. spinulosa* of Presl, the *Aspidium spinulosum* of Swartz, and the *Polypodium spinulosum* of Müller, and we reject the far less appropriate name of *spinosa*, for which there is no admissible authority antecedent to that of Roth—nor even subsequent, for it has been all but universally rejected since his day.

The cultivation of this Fern accords precisely with that of *L. cristata*, and *dilatata*; and though like them not ranking among the most graceful of our large-growing Ferns, it has like them a certain degree of character, and is not inelegant.

Mr. Wollaston notices two variations of this plant. 1. *multifida*, in which the fronds are occasionally simply forked at the apex; it is not permanent under cultivation. 2. *incisata*, in which the fronds are curiously jagged.

PLATES XXII. XXIII. XXIV. XXV. XXVI.

THE BROAD PRICKLY-TOOTHED BUCKLER FERN
(LASTREA DILATATA).

LASTREA, *Presl.*

Clusters of Spore-cases circular medial or subterminal on the venules, covered by an indusium, or membranous scale. *Indusium* reniform, i.e. more or less regularly rotundate with a posterior notch, attached by the sinus or notch, the margin becoming free. *Veins* simple, forked, or pinnate, *venules* direct, disunited at their extremities.

L. DILATATA fronds ovate, sub-triangular, or oblong-lanceolate, bipinnate, with the pinnules pinnate or pinnatifid, spinosely mucronato-serrate, scales of the stipes numerous, lanceolate, entire or fimbriate, usually dark-centred, indusium fringed with stalked glands.

—— **NORMALIS** fronds ample, ovate, bi-tripinnate, scales of the stipes strongly two-coloured, entire.

LASTREA DILATATA, *Presl, Tentamen Pteridographiae*, 77. *Babington, Manual of British Botany*, 411. *Sowerby, Ferns*, 25, t. 3. *Moore, Handbook of British Ferns*, 128.
LASTREA MULTIFLORA. *Newman, History of British Ferns*, 2 ed. 2 6. *Deakin, Floriographia Britannica*, iv. 113.
ASPIDIUM DILATATUM. *Smith, Flora Britannica*, 1125. *English Flora*, iv. 296. *English Botany*, xxi. t. 1461, *Swartz, Synopsis Filicum*, 420.
ASPIDIUM SPINULOSUM. *Swartz, Schrader's Journal für die Botanik*, 1806, ii. 38 (in part). *Synopsis filicum*, 54 (in part), *Ind. Hist.*, 420. *Smith, Flora Britannica*, 1124. *English Botany*, xxi. t. 1460. *English Flora*, iv. 279 (in part). *Willdenow, Species Plantarum*, v. 262. *Hooker and Arnott, British Flora*, 571 (in part).
POLYPODIUM DILATATUM. *Hoffmann, Deutschlands Flora*, ii. 7.
POLYPODIUM CRISTATUM. *Hudson, Flora Anglica*, 557. *Hoffmann, Deutschlands Flora*, ii. 8. *Bolton, Filices Britannicae*, 12, t. 23.
POLYPODIUM MULTIFLORUM. *Roth, Catalecta Botanica*, 135.
POLYSTICHUM MULTIFLORUM. *Roth, Flora Germanica*, iii. 57.
POLYSTICHUM SPINULOSUM. *De Candolle, Flore Française*, ii. 561 (excl. syn. Swartz).
POLYSTICHUM DILATATUM. *De Candolle, Flore Française*, v. 2[illegible].
PHYSOTERIA DILATATA. *A. Gray, Botany of Northern United States*, 631.
LOPHODIUM MULTIFLORUM. *Newman, Phytologist*, iv. 371. *Appendix*, xvii., *History of British Ferns*, 148.

Var. **TANACETIFOLIA** fronds ample, triangular or sub-triangular, tripinnate, pinnules oblong, the pinnulets ovate-oblong, bluntish with coarse teeth at the apex, indusia small, the margin irregular, slightly glandular, scales of the stipes dark-centred.

LASTREA DILATATA. *S. Moore, Handbook of British Ferns*, ed. 1. 59.
LASTREA MULTIFLORA S. DILATATA. *Deakin, Floriographia Britannica*, v. 113, 120.
ASPIDIUM DILATATUM. *Willdenow, Species Plantarum*, v. 263. *Sprengel, Systema Vegetabilium*, 36.
ASPIDIUM SPINULOSUM. *Schkuhr, Kryptogamische Gewächse*, 48, t. 47.
ASPIDIUM EROSUM. *Schkuhr, Kryptogamische Gewächse*, 46, t. 45.
POLYPODIUM TANACETIFOLIUM. *Hoffmann, Deutschlands Flora*, ii. 8.
POLYSTICHUM TANACETIFOLIUM. *De Candolle, Flore Française*, ii. 562.
POLYPODIUM ARISTATUM. *Villars, Histoire des Plantes du Dauphiné*, iii. 811.

Var. **NANA** fronds dwarf, bipinnate, ovate, somewhat glandular while fresh; pinnules decurrent, connected by a wing, convex, mucronately-toothed, sori biserial, distinct, indusia small evanescent, delicate, at length concealed by the spore-cases, the margin slightly glandular, scales of the stipes dark-centred.

LASTREA MULTIFLORA. *Var.* NANA. *Newman, History of British Ferns*, 2 ed. 2[illegible]. *Deakin, Floriographia Britannica*, v. 111.
LASTREA DILATATA. *Var.* NANA. *Moore, Handbook of British Ferns*, 12[illegible].
LOPHODIUM MULTIFLORUM. *Var.* NANUM. *Newman, History of British Ferns*, 2 ed. 1[illegible]8.

Var. **DUMETORUM** fronds dwarf, widespread, oblong ovate, or triangular-ovate, bipinnate, the stipes, rachides, and under surface of veins clothed with glands, pinnules convex oblong, sori large scattered with glands fringed indusia, scales of the

stipes broad-lanceolate, pale brown, indistinctly two-coloured, fimbriate at the [illegible]

[illegible] *South. English Flora*, iv. 28.
[illegible] T. Moore, MS. in Herb. [illegible] dilatata var. dumetorum, *Hook. Handbook of British Ferns* [illegible]
Lastrea [illegible] var. collina, *Moore, Handbook of British Ferns*, 133 (in part).
L[illegible] *Moore, Handbook of British Ferns* [illegible]
[illegible] *Newman, History of British Ferns*, 2 ed. 2[illegible] (in part).
[illegible] *Newman, History of British Ferns*, 3 ed. 224 (in part).
[illegible] *Deakin, Florigraphia Britannica* [illegible]
[illegible] *Newman, Appendix to Phytologist* [illegible] (in part); *History of British Ferns*, 3 ed. 1[illegible] (in part).

Var. COLLINA fronds narrow-elongate-ovate or ovate-lanceolate, bipinnate, somewhat glandular; pinnæ distant; pinnules convex, oblong or ova[illegible] oblong, obtuse, the basal ones pinnatifid, the lobes very obtuse, serrated towards their apices with coarse acuminate teeth; sori covered by gland-fringed indusia; scales of the stipes dark-centred, few except at the base, where they are subulately tapered, the upper ones often broader.

Lastrea dilatata β, collina, *Moore, Handbook of British Ferns*, 133 (in part). *Babington, Manual of British Botany*, 4[illegible].
Lastrea [illegible] var. collina, *Newman, History of British Ferns*, 2 ed. 223 (in part). *Deakin, Florigraphia Britannica*, iv. 1[illegible] (in part).
[illegible] collina, *Newman, History of British Ferns*, 3 ed. [illegible] (in part).
Lophodium collinum, *Newman, Appendix to Phytologist* [illegible] (in part); *History of British Ferns*, 3 ed. 1[illegible] (in part).

Var. CHANTERIÆ fronds lanceolate, narrowed and truncate below, caudately elongated at the apex, glandular on the stipes, rachis, and under surface; pinnæ distant, the lowest unequally deltoid, the rest nearly equal; pinnules oblong, very obtuse, distant, somewhat convex, deeply pinnatifid, the lobes having coarse aristate teeth; sori biserial on all the smaller pinnules, and on the lobes of the larger ones; indusia margined with small stalked glands; scales of the stipes lanceolate-aristate, entire, with a dark brown central stripe, spreading.

Lastrea Ch[illegible], *T. Moore, MS. in herb.*

Var. ANGUSTA fronds linear-lanceolate, bipinnate; pinnæ short, deltoid, the anterior and posterior pinnules of the lower pinnæ very unequal; scales of the stipes narrow-lanceolate, pale-brown, two-coloured; sori covered by indistinctly glandular indusia.

Lastrea dilatata, [illegible] angusta, *Moore, Handbook of British Ferns*, [illegible]

Var. ALPINA fronds narrow linear-lanceolate, membranaceous, bi-subtripinnate; pinnæ unequally deltoid; scales of the stipes broad-lanceolate, pale-brown, variously two-coloured; sori large, numerous, with small evanescent ragged glandular indusia.

Var. GLANDULOSA fronds ample, lanceolate-ovate, or oblong-lanceolate, tripinnate below, densely covered with stalked glands beneath, as well as on the stipes and rachis; scales of the stipes pale whole-coloured, or faintly two-coloured, broadly lanceolate-ovate, semi-appressed.

Lastrea dilatata, [illegible] glandulosa, *Moore, Handbook of British Ferns*, [illegible]
Lastrea [illegible] *Newman, Phytologist*, iv. [illegible]
Lophodium glandulosum, *Newman, Appendix to Phytologist* [illegible]; *History of British Ferns*, [illegible]
Lophodium [illegible] *Newman, Phytologist*, [illegible] 37[illegible]

EXPLANATION OF THE PLATES

Plate XXII. Lastrea dilatata, from Hampstead Heath, Middlesex; *T. M.*
Plate XXIII. Lastrea dilatata [illegible], from [illegible], Gloucestershire; *F. T. Beaute*[illegible]
Plate XXIV. Lastrea dilatata [illegible], from [illegible]; *Rev. [illegible] M. Chanter.*
Plate XXV. Lastrea dilatata [illegible]. A, from Silverdale [illegible] near Coniston; *[illegible].* B, raised from spores of the same. C, from Festiniog, Wales; [illegible]
Plate XXVI. A, Lastrea dilatata collina, from Elter Water, Westmoreland; *Rev. G. [illegible]*. B, from T[illegible]; *T. [illegible]*. C, Lastrea dilatata [illegible], from Settle, Yorkshire; *J. T[illegible]*. D, from [illegible], Devonshire; *Rev. J. M. Chanter.*

LASTREA [illegible] The [illegible] form of the present species is generally distributed over the United Kingdom [illegible] [illegible] Great Britain and Ireland [illegible] [illegible] England [illegible]

NATURE PRINTING.

Lastrea dilatata.

NATURE PRINTING.

Lastrea dilatata glandulosa.

ATUPE PRINTING.

Lastrea dilatata Chanteriæ.

THE BROAD PRICKLY-TOOTHED BUCKLER FERN

Mr Tatham, in rocky situations, near Settle, in Yorkshire, and by the Rev. J. M. Chanter, on stone walls, near Ilfracombe, in Devonshire; and we have found a very similar, if not identical, form, in several parts of Scotland; according to Mr Newman it is frequent in the hill districts of Scotland, Ireland, and Wales. Sir J. E. Smith's *dumetorum* is recorded as occurring in rocky places in Mount Gilder, and near Thomas Vaughan, in Wales; in Westmoreland, in rocky places in Lovell and Wood, Edinburgh, and in a rainford Moor, Derbyshire. The dwarf subdeltoid glandular fern we now think identical with this, and which Mr Newman associates with *collina* is found at Silverthwaite, near Coniston, in Lancashire, by Miss M. Beever; in the Isle of Man, by Dr Anchin; near Ilfracombe, in Devonshire, by the Rev. J. M. Chanter; in Wales, at Festiniog, by Dr Anchin; and on Gamrhin, above Rhayader, by Mr. J. R. Cobb; in Scotland, by ourselves at Tarbet, in Dumbartonshire, and Cove, in Argyleshire, and in the Isle of Arran. The fern *dumetorum*, which we also consider identical, is from Scotland, in the Isle of Arran. The variety *collina* seems confined to the lake districts, unless, indeed, as suspected, it may occur in Ireland; it was first brought into notice by the Rev. G. Fisher, who found it in Westmoreland, and Yorkshire, and we are indebted to Miss S. Beever for plants found by Mr T. Eccleston at Torver, near Coniston, in Lancashire. The variety *Chantenae* was found in a wood at Hartland, Devonshire, by the Rev. J. M. and Mrs. Chanter. The variety *angusta* was gathered at Tonbridge Wells, by the late Miss Bower. The variety *alpina* we have gathered only at Ben Lawers, Perthshire. The variety *glandulosa* was first found by Mr W. Bennett, near Lydbrook, in the forest of Dean, Gloucestershire, and has been subsequently obtained by Mr Doubleday in Epping Forest, Essex.

GEOGRAPHICAL DISTRIBUTION.—*Lastrea dilatata* is a common and generally dispersed European species, occurring from Lapland and Norway to the Savoy Alps, Portugal and Spain. In Asia it occurs in Kamtchatka, near Petropaulowski, and in Mingrelia; in Africa, in the Azores; and in America at Sitka, and Kodiak in the Russian territory; at Port Mulgrave, and in the Rocky mountains; in New England and Canada (*Hb. Hooker*). There is also in the Tookerian Herbarium a specimen labelled from New Zealand.

Caudex stout, usually erect, rarely decumbent, not creeping, often becoming elongated and trunk-like, sometimes tufted, the crown densely scaly; the fronds arranged in a circlet around the crown, when the caudex is erect. *Scales* lanceolate-subulate, hair-pointed, brown, with a dark centre and paler margins. *Fibres* dark-brown, numerous, coarse, branched, tomentose.

Stipes terminal, and adherent to the caudex, variable in length, usually from about one-third to one-half the entire length of the frond, stout at the base, green, densely scaly; the scales spreading most numerous at the base, but usually abundant throughout the whole length of the stipes, and in the normal plant lanceolate-attenuate, and dark-centred like those of the crown, frequently almost black; rachis convex behind, channelled in front, smooth, or in some plants otherwise normal, clothed with glands; somewhat scaly, especially at the back, with small subulate more or less distinctly two-coloured scales.

Vernation circinate, the rachis often folded laterally as well as involutely fore and aft, the apex being simply circinate.

Frond averaging two to three feet, but (exclusive of the varieties noticed below) varying from about a foot to five or six feet in length, and from six to sixteen inches in breadth, herbaceous, dark green above, paler beneath, spreading and more or less arched or drooping, ovate or ovate-lanceolate in the typical form, bipinnate or tripinnate. *Pinnæ* numerous opposite or sub-opposite, the pairs more distant below. The lowest pair are obliquely triangular elongate, the posterior pinnules being much larger than, often twice as large as, the anterior ones; the pinnæ of a few of the succeeding pairs have also an obliquely-deltoid outline, which gradually disappears towards the upper part of the frond, so that those of about the third or the fourth pair and those above them, are nearly equal-sided; the upper pinnæ are also narrower, tapering very gradually from the base to the apex. *Pinnules* ovate-oblong, acutish, often convex, the basal ones stalked, the upper sessile and decurrent; the lower ones (especially those of the lowest pinnæ) are very deeply pinnatifid, sometimes pinnate, and the lobes or pinnulets are oblong and bluntish in outline. All the divisions are sharply-toothed, with teeth of sub-ovate form, terminating in a bristle-like point or mucro, which is in general curved laterally towards the apex of the pinnule or lobe.

Venation of the pinnulets of the lower pinnæ, consisting of a stout flexuous *vein*, proceeding from the rachis-like vein of the primary pinnule, forming a midvein, from which a *venule* proceeds into each marginal lobe, and this is forked where the lobe is toothed, so as to give off a branch towards each tooth, the anterior branch being fertile at some distance below its apex. In the larger of the less divided primary pinnules, the same arrangement occurs on a reduced scale, the midvein producing a *vein* for each lobe, and this again a *venule* for each tooth, the lowest anterior venule only being fertile

The same, still more simplified, occurs in the smaller primary pinnules. The venules all terminate in a small club-shaped apex, below the tooth towards which they are directed

Fructification on the back of the frond, and occupying the whole under surface. *Sori* numerous, variable in size, distinct, round, indusiate, medial, sub-terminal or terminal, seated on the anterior basal venules in the less divided pinnules, and on the lowest anterior branch of the venules in the more compound pinnules, in the former consequently ranging in two lines, one on each side the midvein and much nearer to it than the margin, in the latter forming two lines in a similar way along the lobes

Indusium reniform, rather large, convex, membranous, fringed around the margin with stalked glands or sometimes, small, flat, and indistinctly glandular *Spore-cases* numerous, brown, rotundly obovate. *Spores* roundish or oblong, angular, muriculate.

Duration The caudex is perennial. The fronds are semi-persistent, continuing, under shelter, through the winter, though decaying at the base of the stipes. The young fronds are produced in spring, and additional ones uncertainly during the summer

This is a most variable species, extremely difficult to understand. It is more or less intimately united with two or three kindred species, by means of transition forms, the kindred British plants being *L. fœniscii* on the one hand, and that known as *L. spinulosa*, on the other. The latter is distinguished by its creeping caudex, the few broad pallid scales of its stipes, and its entire indusium the former by its more strictly evergreen habit, by its lacerated scales, its anthoxanthoid fragrance, and by the absence of stalked glands from the margin of its indusium. *L. fœniscii* may also be known by the concavity of its pinnæ and pinnules, and even in the decay of its fronds it is peculiar, for whilst *L. spinulosa* and *L. dilatata* decay first near the base of the stipes, so that the fronds fall, while they appear green and fresh upwards, in *L. fœniscii* the stipes continues firm, while the apex of the frond is undergoing decay, the disorganisation in this case going on from above downwards, and not from below upwards. The marks of *L. dilatata*, in the group of which its variations form so large a proportion, are, its lanceolate entire dark-centred scales, and its glandular-fringed indusium

The Tansy-leaved Prickly-toothed Buckler Fern—L. DILATATA TANACETIFOLIA—is a tripinnate state of the species, with broad fronds indicating a tendency towards a triangular outline, which is sometimes strongly marked. The fronds are usually large, though there occur plants of but moderate size, in which the peculiarities of the form are fully developed. The stipes has the usual entire lanceolate dark-brown abundant scales, marked with a still darker bar down their centre. It is one of the commoner forms of the species, and a variable form, merging gradually into that which we have considered as the type of the species. We are indebted to Professor Fée of Strasburg for a specimen of the *Polystichum tanacetifolium* of De Candolle, which has enabled us to identify it with this form of *L. dilatata*

Mr. Tatham's, or the Dwarf Prickly-toothed Buckler Fern—L. DILATATA NANA—(PLATE XXVI. C.D.) differs most obviously from the usual and commoner forms of the species, in its constantly smaller size, the extreme length of the fronds, including the stipes, varying from two to four inches in the smallest forms, to eight or ten inches in the largest forms of the variety. This diminutive size is a permanent characteristic, the variety having been observed by Mr J. Tatham to grow near Settle, in Yorkshire for the last twenty years without change, and in company with the ordinary forms of the species three feet in height, and the Rev J. M. Chanter has observed the same fact of constancy for a series of years in plants of this variety which occur near Ilfracombe, in Devonshire. Even when freely manured Mr Tatham's plant, though growing about fifteen inches high, does not lose the dwarfish aspect of the natural specimens, and cultivation in a greenhouse does not add to the size of the wayside plants. The latter assume some slight variations among themselves. The fronds (of the Settle plants) are of

an ovate outline broadest at the base, the stipes forming nearly half the entire height. Both the stipes and rachis, as well as the under side of the veins, are sparingly clothed with short-stalked glands. The stipes is clothed thickly at the base, more sparingly upwards, with lanceolate scales having the usual dark central mark. The lowest pinnæ are unequal-sided, but the rest are nearly equal. The fronds are bipinnate, but the pinnules are decurrent, more or less convex, the larger ones somewhat lobed, with serrated loves, the rest merely serrate with spinulose teeth. The sori are most copious in the upper part of the frond, and form a line on each side the midvein of the pinnules nearer the rib than the margin, they are rather small, formed of roundish obovate spore-cases, which are almost black when fresh, and are covered by a small, delicate, somewhat glandular-margined indusium, which soon shrivels and becomes concealed among the spore-cases.

Miss Beever's, or the Thicket Prickly toothed Buckler Fern—L. DILATATA DUMETORUM—(PLATE XXV.) is a dwarf or dwarfish form, with broad ovate, or elongate-triangular, or sometimes, deltoid fronds, remarkable for their glandular surface, and their large abundant sori produced freely on plants of very immature age. This form of the plant, which appears to us entitled to specific distinction, occurs under several modifications, some of which have been referred to the var *collina*, with which, however, they do not agree. Of these modifications, one discovered in the Lake district by Miss Beever, to whom we are indebted for specimens and plants, is the most marked with which we are acquainted, and like the rest, sufficiently accords with the imperfect specimens of Sir J. E. Smith's *Aspidium dumetorum*, to be found in his herbarium. This plant has elongate-triangular-ovate fronds growing about a foot high, and very glandular, especially on the stipes, rachis, and lower surface of the veins; they are bipinnate, the pinnæ concave and bluntish, the pinnules broad oblong, or oblong-ovate, convex, crispy, and coarsely toothed, the teeth broad and acuminately tipped by a small bristle. The stipes is sparingly clothed with lanceolate scales of variable width, and of a pale-brown colour, scarcely at all darker in the centre, and having their margin fimbriate. The sori are large, distinct, produced over the whole under surface, and covered by indusia, which are prominently fringed with stalked glands. Young plants of this form, but a few months old, and three or four inches high, bear fronds which are abundantly fertile. With this we associate the following, which agree in the pale-coloured, broad lance-shaped, sparingly fimbriated scales of the stipes and crown, in the dwarf habit, the subtriangular or ovate fronds, in the glandulose surface, and the large distinct sori:—(1) a Fern found at Festiniog by Dr Allchin, somewhat larger in growth under cultivation, less concave in the pinnæ, and therefore less crispy-looking; (2) another similar, from the hills above Rhayader, found by Mr. J. R. Cobb; (3) Dr Deakin's *L. maculata*, found on Goatfell, Arran, which is also a dwarf glandular form of the species, with a more ovate outline of frond; (4) a similar plant, which we gathered at Tarbet, in Glen Croe, and on the coast of Arran; (5) a form having the same general characteristics, found by the Rev. J. M. Chanter, in the vicinity of Ilfracombe in Devonshire; and (6) a similar form found in the Isle of Man, by Dr Allchin. These all differ from that first described in little but the absence of the crispy aspect of the pinnules, which has been already mentioned, and do not differ among themselves more than the forms of many other Ferns.

Mr Pinder's, or the Hill Prickly-toothed Buckler Fern—LASTREA DILATATA COLLINA—(PLATE XXVI., A.B.) was first brought into notice by the Rev. G. Pinder, to whom we are indebted for specimens and much information concerning it. It is a remarkably neat-looking form of the species, having sometimes an ovate outline of frond, attenuately elongated at the apex, but also occurring in a more elongated or an oblong-lanceolate or ovate-lanceolate form. The fronds are dark-green, one to two feet high, smooth or sparingly glandular, bipinnate. The stipes is variable in length, both in wild specimens, some of which are found beneath masses of rock, and under cultivation, from one-half to one-third the length of the fronds, green above, tinged with dark purple-brown at the base, scaly, with entire lanceolate dark-brown scales, which have a conspicuous darker central mark, the scales at the base of the stipes, where they are most numerous, are narrow, and have a long subulate point, higher up

they are scattered, and many of them broader and shorter, and the rachis itself is almost devoid of scales. The pinnæ, especially the lower ones, are distant and spreading the first pair unequally deltoid, the next more elongate and less unequal, the remainder narrower, parallel-sided, rounding slightly near the end to an acutish, not at all acuminate, point. The pinnules are convex, obtusely oblong-ovate, the basal ones narrowed to a broadish stalk-like attachment, the rest sessile and more or less decurrent, the larger pinnules are deeply pinnatifid with blunt oblong lobes, sparingly toothed mostly at the apex, with coarse acuminately aristate teeth. The sori are for the most part arranged in two lines along the pinnules, as in the smaller forms of the species, and they are covered by gland-fringed indusia. The plants from Torver near Coniston, communicated by Miss S. Beever have prettily concave pinnæ, and strongly convex pinnules, they are also somewhat glandular, which is hardly, if at all, the case with the plant sent by Mr Pinder

Mrs. Chanter's Prickly-toothed Buckler Fern—L. DILATATA CHANTERIÆ—(PLATE XXIV.) is a remarkably distinct form of the species, differing obviously in the narrowed form and attenuated apex of its fronds, its distant pinnæ, and its distinct blunt pinnules. It is of medium size, growing from a foot and a half to two feet in height, the fronds growing nearly erect, and being of a lanceolate or oblong lanceolate form with the base somewhat narrowed, and the apex attenuated. The stipes, rachis, and under surface of the fronds are clothed with sessile or very shortly-stalked glands. The stipes is clothed rather plentifully with lanceolate and ovate-lanceolate entire scales, which are of various sizes, brown, with a dark central streak and tipped by a long-ish, weak, bristle point. The fronds are bipinnate, the pinnæ distant, somewhat spreading, and more or less twisted, so that the upper surface is directed towards the zenith, the lowermost pair are very unequally deltoid, their posterior basal pinnules being more than twice the length of the anterior ones, and these posterior pinnules are almost themselves pinnate, the next pair is unequally deltoid, but the posterior pinnule is only about one-third longer than the anterior, the inequality is nearly lost in the next and the succeeding pinnæ which narrow gradually to the apex. The basal pinnules of these upper pinnæ are nearly oblong, their base being but little broader than their apex, which is very blunt, they have a narrow stalk-like attachment, which becomes broader and decurrent in the pinnules higher up the pinnæ. The pinnules are more or less deeply pinnatifid according to their position on the pinnæ, and the lobes, which are bluntly oblong, have a few coarse distinct teeth, each of which is terminated by a bristle-like point The sori, which form a line on each side near the midrib of the smaller pinnules, and a double line along the lobes of the larger ones, are covered by reniform indusia, which are fringed with small stalked glands at the margin. This very marked variety was discovered in 1854, by the Rev J M. Chanter and Mrs. Chantor, after whom it has been named, at Hartland, on the north coast of Devon, where it was found growing in moderate quantity within a limited area, and accompanied and surrounded by other common forms of the species. We are indebted to Mr Chanter for the specimen figured, and for having plants collected during the present year, from which latter our description has been prepared.

The Linear Prickly-toothed Buckler Fern—L. DILATATA ANGUSTA—is a variety having the outline and general features of the erect typical form of *L. spinulosa*, but possessing also the particular characteristics of *L. dilatata* It has narrow linear-lanceolate bipinnate fronds, about two feet high, the stipes moderately furnished with large attenuately lance-shaped pale-brown dark-centred scales, the pinnæ shortly deltoid, and the lower two or three pairs very unequally so, the posterior pinnules being much the largest, the pinnules narrow, oblong, obtuse, deeply pinnatifid with ovate or oblong lobes having aristate teeth. The sori are small, abundant, occurring from the base to the apex of the frond, and covered by small symmetrically glandular convex indusia

The Alpine Prickly-toothed Buckler Fern—L. DILATATA ALPINA—has fronds of the outline of ordinary states of *L. spinulosa*, that is, straight-sided broadly linear scarcely lanceolate they are almost tripinnate below, bipinnate upwards, the pinnæ ovate-lanceolate, or ovate, ascending membranous in texture, and bearing two rows of large prominent sori, of which the covers, which are very evanescent

'ATURE PRINTING.

Lastrea dilatata dumetorum.

are small, and somewhat glandular on the margin, the teeth of the pinnules are mucronately tipped. The scales are broad lance-shaped, pale brown, with a dark central mark. This form occurs plentifully among rocks on the higher parts of Ben Lawers, Perthshire.

The Glandular Prickly-toothed Buck or Fern. L. DILATATA GLANDULOSA—(PLATE XXIII.)—is a large and somewhat erect growing plant, with much the aspect of a large broad *L. spinulosa*, but differing from that in the intermediate form of the scales of the stipes, in their frequently being two-coloured, in the glandular-fringed indusia, and in the suberect, not creeping caudex. The fronds grow from a foot and a half to three or four feet high, and are of an oblong-lanceolate figure in the larger plants, or ovate-lanceolate in the smaller ones, growing nearly erect around the stout pale-coloured crown which terminates the thick ascending tufted caudex. They are bipinnate above, tripinnate below, the pinnæ ascending and twisted, so as to form nearly a horizontal plane, lanceolate-ovate, the longest nearly six inches long, and about two inches broad just above the base, pinnules lanceolate-ovate, or pyramidate ovate, acute averaging nearly an inch in length over the greater part of the frond, the posterior ones on the lower pinnæ longest, those of the lowest pinnæ being an inch and three-quarters long, the lower ones stalked, the rest successively decurrent, adnate, confluent. The pinnules are pinnatifid almost down to the midvein, their lobes oblong, acute, incised or toothed the serratures all tipped by a bristle-like point. The stipes varies from about one-third to one-half the entire length of the frond, and is clothed sparingly upwards, more thickly near the base, with ovate blunt-ish, and ovate-lanceolate pointed scales, which are generally of a pale brown, scarcely tawny, some having and others wanting a darker central streak, many of them as seen in the growing plant, becoming a good deal appressed to the stipes, whilst a few remain spreading, but this appears to be far less obvious when dried. The stipes, rachides, and under surface of the fronds, are densely covered with stalked glands. The fructification is copious over the whole frond, and forms two lines on each of the smaller pinnules, or on the lobes of the larger ones, and the sori are covered by indusia, which are fringed with stalked marginal glands. This Fern was first noticed by Mr Bennett, of Brockham, and his son, Mr E. T. Bennett, near Lydbrook, in the Forest of Dean, Gloucestershire, and was subsequently gathered at the same place by Mr. W. H. Purchas, of Ross. It has since been found in Epping Forest, in Essex, by Mr H. Doubleday. We are indebted to these gentlemen for both specimens and living plants. Mr S. F. Gray has communicated (1) a frond much smaller, with paler scales, and less pyramidate pinnules, but glandular, and perhaps referrible to this form of the species, which had been gathered near Croydon, Surrey, by Mr J. Hutcheson, and 2) another glandular Fern, gathered by himself at Barnes, Surrey where we have also found it sparingly. The latter is certainly not identical with the Dean Forest and Epping plants, but approaches them closely in some respects, differing chiefly in its laxer habit, and less elongated fronds, and in the presence of more numerous long-pointed lanceolate and dark-centred scales among the broader ones on the stipes. We have gathered another glandular Fern at Hampstead, Middlesex, somewhat different, especially in the scales, which are long and very narrow and in the more obtusely ovate form of the pinnules. This latter, with that from Barnes, supplies the connecting links between *glandulosa* and *dilatata*, the most ordinary looking forms of the latter being moreover sometimes quite glandular.

Besides the varieties already mentioned, which we consider the most distinct and important, there are many other, indeed almost endless, modifications of this Fern, many of which, however, we believe to be permanent forms, although they have not all been proved by cultivation. The following is a brief summary of the various forms which have come under our observation.

1. *multifida* (W.). Mr Wollaston describes this as having the rachis divided very low down, so that in fact, two fronds are, as it were, borne on one stipes. It is, however, rarely that more than one or two fronds on a plant are affected, and the variation is not constant.

2. *lanuginifolia* (M.). A common broad tripinnate, triangular or sub-triangular, usually large

growing form of the species of which the lax state is remarkably elegant. The form here intended has the usual dark-centred scales.

3. *pumila* (M.). A small subdeltoid or ovate-deltoid bipinnate variation, in which the scales are pallid. We have gathered it at Hampstead, Middlesex, and Tarbet, Dumbartonshire. It is the form referred to as *dumetorum* in the *Hand-book of British Ferns*, where it was mistaken for Sir J. E. Smith's species. There occurs also a form similar to this in appearance, except that the scales are more strongly two-coloured. We have seen this latter from Aber, Carnarvonshire; Rothesay, Bute; and the mountains of Dublin and Wicklow.

4. *deltoidea* (M.). This is a Devonshire plant, collected by the Rev. J. M. Chanter. It grows about two feet high, and has deltoid tripinnate finely-cut fronds, the stipes slender, and the whole aspect of the plant light and elegant. The scales are dark-coloured.

5. *fuscipes* (M.). A glandular form of very elegant appearance, growing two feet high, the fronds nearly as broad as long (one foot high and ten and a half inches wide), tripinnate, the points of the frond and pinnæ caudate. The stipes, which is comparatively slender, and has dark narrow scales, is of a pale chestnut brown behind. It was obtained in Guernsey by Mr. G. Wolsey, the fortunate discoverer in that island of *Ophioglossum lusitanicum*.

6. *mucronata* (M.). The peculiarity of this form, which has a stout stipes clothed with large very dark scales, and is of the normal ovate-lanceolate outline, and about two feet high, is, that it is more finely divided than usual. Though small in size, it is almost quadripinnate, and the pinnules and lobes have sharp narrow teeth. It was found in the neighbourhood of Ilfracombe by the Rev. J. M. Chanter.

7. *nana* (Newm.). The experience of Mr. Tatham and Mr. Chanter proves this to be a permanent variety, and not an immature condition of the plant, as might be supposed. It has the appearance of a plant of dwarf stature, varying from two or three inches to nearly a foot in height. The fronds are ovate, bipinnate, and the stipes is furnished with lanceolate dark-centred scales. The plants from Settle and from Ilfracombe are very similar, but from the latter neighbourhood there are two forms differing slightly in the colour of the scales, and in the form and manner of the toothing of the pinnules, the dwarfer plant having the more pallid scales.

8. *dumetorum* (M.). A dwarf plant, with ovate or elongately triangular fronds, clothed beneath and on the stipes and rachis with glands; the stipes furnished with pale faintly two-coloured scales, which are peculiar in being fimbriated sparingly along their margins. The sori are large, scattered, and produced freely on both young and small-sized plants. The largest plants seldom exceed a foot in height. Some of the forms have been referred to *collina*, but it differs from that, in its abundant glands, and its pallid fimbriated scales. The Arran, Devon, and Isle of Man forms have their scales somewhat less fimbriated than the others. A small ovate form, agreeing with this in the scales and in the glands, found in Glen Croe, Argyleshire, is tripinnate at the base, and has the pinnules much smaller than usual, giving it a somewhat different aspect, and it is probably a permanent departure from this type of variation.

9. *collina* (Newm.). This is a narrow erect form, from one to two feet high, with the fronds varying from narrow ovate elongated at the point, so as to become ovato-lanceolate, to narrow oblong-lanceolate. The pinnules are bluntly-oblong, with coarse acuminately-aristate teeth. The scales of the stipes are long, narrow, and strongly two-coloured. Some of the plants we have seen are smooth, others sparingly glandular, but much less so than *dumetora*. It is a very distinct, elegant, and permanent form.

10. *Smithii* (M.). A small plant, which, on the authority of Mr. H. Shepherd, of Liverpool, was sent him by Dr. Mackay, and is the plant from which Sir J. E. Sm[illegible] drew up his [illegible] of *[illegible] spinulosum*. [illegible] the plant from [illegible] mentioned in *English Ferns*, [illegible]. The fronds are short, the pinnæ of the lower half of equal length, and with the tapering apex [illegible] a narrow elongately [illegible]. The pinnæ are opposite, horizontal [illegible]

RINTING.

A.B. Lastrea dilatata collina: C.D. L. dilatata nana.

having but slight inequality in the size of the pinnules, these latter are narrowly decurrent on the rachis, oblong obtuse, with acuminately aristate teeth. The scales are dark, two-coloured, lanceolate, narrower and more elongated about the base of the stipes. The plant is related to *collina*, and is, perhaps, only a modification of it. The Irish forms of this affinity are little known, and require a more complete investigation than has hitherto been given to them, and the same remark applies to the Irish forms related to *dumetorum*.

11. *Chanterae* (M.). This elegant variety grows about two feet high, and is of erect habit, with the pinnæ twisted, so that the upper surface is directed towards the zenith. The fronds are glandular lanceolate, narrowing yet terminating abruptly at the base, attenuated and caudate at the apex. The lower pinnæ are very unequal-sided, the next pair or two much less so, and those above nearly or quite equal. The fronds are glandular, the stipes abundantly scaly, with lanceolate scales, having a dark-brown centre, and terminating in a long weak point. The sori are small, numerous, forming two lines near the midrib, and covered by gland fringed indusia. The largest fronds are two feet high, including a stipes of nine inches, the lowest pinnæ three and a half inches long, and an inch and a half broad, the longest, about the centre of the frond, five inches long, and an inch and a quarter broad. The pinnules are separated by a space often nearly equal to their own width.

12. *distans* (M.). This is something like the last, but smooth, more lax in habit, and the fronds also appear to attain a larger size. The outline is ovate, the pinnæ distant, and the inequality of their sides not very apparent except in the lowest pair, the pinnules wide apart, ovate oblong obtuse, the narrowed stalk like base somewhat decurrent, the teeth acuminately aristate. The sori are numerous, forming two lines near the midrib, the indusium slightly glandular. It was found at Coombe Wood, Surrey, by Mr S. F. Gray.

13. *obtusa* (M.). This form does not associate with any of the others we have seen. The fronds are in outline narrow ovate, with oblong obtuse shallow-lobed pinnules; otherwise normal. We have found it at Hampstead, Middlesex, Hastings, Sussex; Ardrishaig, Argyreshire, and the Rev. J. M. Chanter has found a similar form near Ilfracombe, Devonshire.

14. *angusta* (M.). This has linear fronds about two feet high, with a long stipes, equalling the leafy part in length. The pinnæ are ascending, the three or four lowest pairs very unequal-sided. The scales are lanceolate and two-coloured, otherwise the fronds have quite the aspect of those of *L. spinulosa*, in its extreme typical state. The variety was established (*Handbook of British Ferns*, 124) on two fronds gathered by the late Miss Bower, near Tunbridge Wells. We have subsequently seen somewhat similar forms from Glen Croe, Argyleshire, and from Hartland, Devon, at the latter place Mrs. Chanter found it in company with *Chanterae*.

15. *alpina* (M.). In this form the fronds have ascending pinnæ, of which the lowest are but little shorter than several of the succeeding pairs, so that the outline is narrow, scarcely lance-shaped, the lowest pinnæ are very unequal sided, the rest becoming gradually less so. The fronds are often almost tripinnate at the base, and of a much more delicate texture than any other form we have seen. The sori are large and numerous, with small very evanescent indusia, having a ragged glandular margin. The scales are broad-lanceolate, pale-brown, with a dark central mark varying in intensity. This variety we gathered on Ben Lawers, Perthshire, and we have seen no other form correspondent with it, unless a small plant with ovate fronds, found by Dr Barfour on Ben Voirlich, and which does not well associate with any other form, is a small state of the same plant.

16. *glandulosa* (Newm.). A large growing erect variety, with fronds of an oblong-lanceolate outline, tripinnate below, the lower pinnæ broad and unequally deltoid, the upper lanceolate-ovate, the pinnules are pyramidately-ovate acute. The sori, which are copious over the whole frond, are covered by gland fringed indusia. The scales of the stipes are ovate-lanceolate acute, pale-brown, unequally marked with a darker central blotch, less spreading than in other varieties. There are two or three other large-growing glandular forms, which serve to unite this with *L. dilatata*, in its ordinary state.

17. *valida* (M.). A stout, erect, broad, rigidly fleshy-looking form, thick and leathery when dry the fronds ovate, the pinnules divided almost to the midrib over the greater part of the fronds. The venules terminate in a hair-like white line near the margin on the upper surface, and give the plant a faintly strigose appearance. It has been sent to us by the Rev J. M. Chanter, from Devonshire, and by Mr C. Jackson, from Guernsey.

18. *Schofieldii* (Stansfield). This very diminutive plant was found by a gardener named Schofield near Buxton, Derbyshire, a few years since, and has since retained its peculiarities under cultivation. It is uncertain whether it should be referred to *L. dilatata* or *L. spinulosa*, and its tendency to a creeping habit of growth, as well as its concolorous scales, rather lead to the inference that it belongs to the latter, but it is yet altogether too diminutive, and too little known to admit of the question being decided. The fronds rarely attain a length of more than three or four inches, and more generally do not exceed two, they are usually ramose, sometimes not, often multifid, sometimes not, and when single, they are pinnate, the pinnæ oblong and simply notched. The whole plant, which is quite a curiosity, and as yet a rarity, is somewhat analogous to the var *crispum* of *Athyrium Filix-femina*.

In a plant so sportive as *L. dilatata*, and so widely and variedly dispersed as to latitude, elevation, and locality, it is probable there may be other variations besides those we have enumerated, sufficiently different from them to interest those who study the diversities which occur in the forms of plants.

PLATE XXVII.

THE HAY-SCENTED, OR CONCAVE PRICKLY-TOOTHED BUCKLER FERN (LASTREA FŒNISECH).

LASTREA, *Presl*

Clusters of Spore-cases circular medial or subterminal on the venules, covered by an indusium, or membranous scale. *Indusium* reniform, *i.e.*, more or less regularly rotundate with a posterior notch, attached by the sinus or notch, the margin becoming free. *Veins* simple, forked, or pinnate, *venules* direct, disunited at their extremities.

L. FŒNISECH fronds triangular or triangular-ovate, tripinnate, spreading, pinnules concave, pinnulets pinnatifid, the mucronately serrate lobes curved upwards, scales of the stipes concolorous, narrow-lanceolate, fimbriate or laciniate, indusium margined with minute sessile glands.

LASTREA FŒNISECH, *Watson, Phytologist*, i. 568. *Babington, Manual of British Botany*, 411. *Deakin, Flora Britannica*, iv. 1 7. *Moore, Handbook of British Ferns*, 32. *Sowerby, Ferns*, 27 t. 14.
LASTREA DECURVA, *Newman, Natural's Alamanac*, 1844, 23. *History of British Ferns*, 2 ed. 225.
LASTREA CONCAVA, *Newman MS. History of British Ferns*, 2 ed. 235.
NEPHRODIUM FŒNISECH, *Lowe, in Cambridge Philosophical Transactions*, iv. 7.
ASPIDIUM RECURVUM, *Bree, Phytologist*, i. 3.
ASPIDIUM DILATATUM, var. RECURVUM, *Bree, Magazine of Natural History*, i. 102.
ASPIDIUM DILATATUM, *Dunkerton, Arnott, British Flora*, 341.
LOPHODIUM FŒNISECH, *Newman, Appendix to Phytologist*, 1857, xvi. *History of British Ferns*, 36.
LOPHODIUM RECURVUM, *Newman, Phytologist*, v. 371.

EXPLANATION OF THE PLATE.

PLATE XXVII. LASTREA FŒNISECH from Balcombe, Sussex. *S. G. Gray.*

HABITAT. This Fern is found plentifully on the Peninsula formed by the counties of Cornwall, Devon, and Somerset; it also occurs in several parts of Sussex. It has not been seen in the south-eastern portion of England, but has been gathered in several parts of Wales, in the Isle of Man, in North Lancashire, in Cumberland and Northumberland, and both on the eastern and western sides of Yorkshire. In Scotland it occurs on the shores of Loch Lomond, on the west coast of Argyleshire, in the Isles of Arran and Mull, in Orkney and on outer Hebrides. In Ireland it is abundant. The range in altitude appears to extend from the coast level, to an elevation of about 600 feet. It prefers shady rocky habitats.

GEOGRAPHICAL DISTRIBUTION. Beyond the limits of the United Kingdom, the species is found, we believe, only in the Atlantic Isles off the African coast, namely the Azores, Madeira, and the Cape de Verd Isles.

Caudex stout, densely scaly, tufted, erect or sometimes decumbent, formed of the bases of the fronds surrounding a woody axis. *Scales* narrow-lanceolate, pale ferruginous, concolorous, variously and sparingly fimbriate or lacerate on the margin. *Fibres* long, stout, wiry, branched, dark brown, tomentose.

Stipes usually about half the entire length of the frond, rigid, moderately stout, brownish-purple from the base upwards, furnished plentifully with subulately-lanceolate entire fimbriate or lacerate scales of a pale rusty-brown colour. *Rachis* greenish, furnished with fewer and smaller scales, and as well as the stipes and secondary rachides bearing numerous small sessile spherical glands.

Vernation circinate.

Fronds numerous, from one to two feet high including the stipes, and from about five to eight inches across, sometimes smaller, of a rich bright green, somewhat paler beneath, drooping, the upper surface crispy, triangular, or elongate-triangular, or sometimes ovate, tripinnate, the lower surface sprinkled with minute sessile glands, terminal, and adherent to the caudex. *Pinnæ* opposite or

sub-opposite, more or less deltoid. The lowest are broadly and unequally so, the pinnules on the posterior side being larger than those on the anterior; they are also usually, but not always, the longest; the succeeding pinnæ become gradually narrower and less oblique. *Pinnules* pyramidately triangular or obliquely-oblong, the basal posterior ones of the lowest pinnæ much longer than the rest, and divided into ovate-oblong or oblong pinnatifid lobes, the largest of which are deeply pinnatifid into oblong serrated lobes. The basal pinnæ, pinnules, and pinnulets are all stalked, the upper ones becoming in gradation sessile and then decurrent. The margins of the pinnules and lobes are mucronately toothed, and these margins are turned upwards from the plane of the spreading or drooping frond so that all the ultimate divisions are concave, and the entire frond has a beautiful crispy appearance which, together with its lively colour and graceful habit, renders it one of the most ornamental of the robust Ferns.

Venation of the pinnulets consisting of a dark-coloured flexuous midvein formed of a branch from the midvein of the primary pinnæ; this produces short lateral forked *veinlets*, the anterior branch of which bears a sorus below its apex; all the veinlets terminate within the margin.

Fructification on the back of the frond occupying the whole under surface. *Sori* round, numerous, minute, forming two rows along each of the pinnules and pinnulets, placed near to the midvein, often becoming confluent. *Indusium* reniform, its margin jagged and uneven, and sparingly furnished with sessile glands. *Spore-cases* numerous, brown, obovate. *Spores* oblong, often angular, muriculate.

Duration. The caudex is perennial. The fronds of one season's growth also endure until after the earlier ones of the following year are produced, so that the plant is evergreen. The growth takes place in succession from the month of May onwards till autumn.

This beautiful plant is quite distinct both in characters and aspect from *L. dilatata* with which it is sometimes associated. Its fragrance, which is a remarkable characteristic, is powerful, resembling that of new hay, becoming too, like that, developed by the desiccation of the plant, and retaining its strength for a length of time in the dried specimens of the herbarium. The scales of the stipes differ from those of *L. dilatata*, both in size, form, and number, being in *L. fœniseca* fewer, narrower, and for the most part either fringed or lacerate at the margin, pale brown, and concolorous. The fronds too are much more decidedly evergreen than in *L. dilatata* or *spinulosa*, and have this peculiarity in their decay, observed by Dr Allchin, that they commence to decay from the point, and not from the base of the stipes. The indusium, moreover, is not bordered with stalked glands. In ordinary cases, the triangular outline and concave crispy surface of the fronds will suffice to distinguish the plant, without recourse to the more minute characters residing in the scales and indusia; but it must be remembered that the plant does vary with more elongated and ovate fronds, and some forms of *L. dilatata* are decidedly triangular in outline.

It grows freely in cultivation, planted in a porous soil of loam and peat, and is to be considered as one of the most ornamental of our native species. The plants may be multiplied by separating the crowns.

Lastrea fœnisecii.

PLATE XXVIII

THE MOUNTAIN BUCKLER FERN (LASTREA OREOPTERIS).

LASTREA, *Presl.*

Clusters of Spore-cases circular, medial or subterminal on the venules, covered by an indusium, or membranous scale. *Indusium* reniform, *i.e.*, more or less regularly rotundate with a posterior notch, attached by the sinus or notch, the margin becoming free. *Veins* simple, forked, or pinnate, *venules* direct, disunited at their extremities.

L. OREOPTERIS fronds resinoso-glandular beneath, lanceolate, very much narrowed below, pinnate, pinnæ linear-lanceolate, deeply pinnatifid, the lobes oblong, flat, sori marginal, caudex tufted.

LASTREA OREOPTERIS, *Presl, Tentamen Pteridographiæ*, 76. *Babington, Manual of British Botany*, 410. *Drakin, Florigraphia Britannica*, v. 98. *Sowerby, Ferns*, 7. *Moore, Handbook of British Ferns*, 100. *Newman, History of British Ferns*, 2 ed. 18.

LASTREA MONTANA, *T. Moore, Handbook of British Ferns*, 100. *Newman, History of British Ferns*, 3 ed. 130.

ASPIDIUM OREOPTERIS, *Swartz, Schrader's Journal für die Botanik*, 1800, ii. 35. *Schkuhr, Kryptogamische Gewächse*, 37, t. 35, 36. *Smith, Flora Britannica*, 1120. *English Flora*, iv. 273. *Hooker and Arnott, British Flora*, 569. *Mackay, Flora Hibernica*, 339. *Wildenow, Species Plantarum*, v. 247. *Sprengel, Systema Vegetabilium*, v.

ASPIDIUM OREOPTERIS, *Gray, Natural Arrangement of British Plants*, ii. 6.

POLYPODIUM OREOPTERIS, *Ehrhart, Beiträge zur Naturkunde*, i. 44. *Smith, English Botany*, xv. [illegible]

POLYPODIUM MONTANUM, *Vogler, Dissertatio de Polypodio montano, cum Icone.*

POLYPODIUM THELYPTERIS, *Hudson, Flora Anglica*, 57. *Bolton, Filices Britannicæ*, 40, t. 22.

POLYPODIUM FRAGRANS, *Hudson, Flora Anglica*, ed. 2, 45. (not of Linnæus).

POLYPODIUM PTEROIDES, *Villars, Histoire des Plantes du Dauphiné*, iii. 841.

POLYPODIUM IMBROSTERMUM, *Allioni, Auctuarium ad Florum Pedemontanam*, 4.

POLYPODIUM MONTANUM, *Roth, Flora Germanica*, iii. 74.

POLYPODIUM OREOPTERIS, *De Candolle, Flore Française*, 563.

DEMESTHEUM MONTANUM, *Newman, Appendix to Phytologist*, 1851, xxii.

EXPLANATION OF THE PLATE.

PLATE XXVIII.—LASTREA OREOPTERIS from Black Park, Buckinghamshire. *Dr. Atchison.*

HABITAT. This species grows in damp woody places, especially luxuriating by the side of a shady cliff or stream, but it is much more profusely met with on the hill sides in nearly mountainous districts. In many parts of the Highlands of Scotland it is the common Fern of the hill sides and road sides. It extends in this direction to the North Highlands and to Western Isles, hence through the Lowlands and the Lake districts, occurs here and there, more or less abundantly in waste districts all over England and Wales. It is also found in all the Irish provinces. Mr. Watson gives its range of elevation as ascending from the coast level to an altitude of about 2850 feet, which may probably be extended to 3000 feet.

GEOGRAPHICAL DISTRIBUTION. This species is met with throughout the whole of Europe, excepting perhaps the East. We have a memorandum of its occurrence at Pico, one of the Azorean islands being probably intended. In the Hookerian herbarium is a specimen labelled from North America, and one from Vermont in that of the Rev. W. A. Leighton. In Chili and Valparaiso occurs an allied plant differing only in being slightly hairy. *Hb. Lindley.*

Caudex stout, tufted, decumbent and slowly creeping formed of the bases of the fronds surrounding a woody axis, scaly. *Scales* pale ferruginous, ovate acuminate. *Fibres* stout, brown, branching.

Stipes short, stout, terminal and adherent to the caudex, glandular, and covered with ovate and lanceolate pale brown membranaceous scales. *Rachis* scaly below, the scales becoming finer and more hair-like upwards, clothed also abundantly with sessile glands.

Vernation circinate, the pinnæ not folded convolutely.

Frond from one to three feet or more in height, the smaller three inches, the larger eight to ten or eleven inches in breadth, erectish, numerous, terminal, bright green or often yellowish, clothed beneath with a profusion of small sessile resinous glands, which give out an agreeable balsamic fragrance. Lan-

ceolate, much tapered below as well as upwards, pinnate. *Pinnæ* opposite or alternate, numerous; the lower ones more distant, obtusely triangular; those higher up gradually lengthening till about the middle of the frond, where they are linear-lanceolate, or rather broadest at the base tapering to a long narrow point; the upper ones again are shorter, but also narrower; all are deeply pinnatifid. *Lobes* flat, oblong, obtuse, entire, or occasionally crenated, sometimes slightly falcate, the basal ones longest.

Venation of the lobes consisting of a flexuous midvein, producing alternate *veins*, which are simple or forked; the *venules* extend to the margin and bear the sori near their apices.

Fructification on the back of the fronds, and most abundant on the upper half. *Sori* moderate-sized, circular, produced near the ends of the venules, and forming a submarginal series, often confluent, sometimes without indusia. *Indusium* small, thin, jagged, evanescent. *Sporecases* numerous, brown, obovate. *Spores* roundish or oblong, muriculate.

Duration. The caudex is perennial. The fronds are only annual, growing up in spring about May, and becoming destroyed by the autumnal frosts.

This fragrant Fern may be at once distinguished by its balsamic scent; by the short lower pinnæ which extend down almost to the caudex of the pinnato-pinnatifid, marginally dot-fruited fronds; and by the latter growing in tufts. The indusia are very small and evanescent, and are sometimes wanting; but the species is too closely allied to other genuine Lastreas, *L. noveboracensis* for example, to permit of its separation from the genus on account of this peculiarity. Indeed, such frivolous distinctions are always to be avoided.

Though so common a species in some localities, it is not one which readily submits to cultivation, and many have been the failures of those who have attempted its domestication. We are indebted to Mr Wollaston for a suggestion which has enabled us to attain greater success than usual, and which is quite in accordance with observations subsequently made in its wild localities. Mr Wollaston's plan is to pot or plant in pure loam, and to keep this soil wet through the winter, when the plants are potted, this being done by keeping a feeder full of water constantly beneath them. Probably a constant supply from a syphon, allowing the superfluous quantity to overflow, so that there might be a constant change going on, would be a still better arrangement; it would at least assimilate more exactly with the constant percolation which must be going on in its native hills. There is no difficulty in securing a supply of the plants in the localities where it occurs, where young seedling plants are most abundant.

Two curious varieties of this species have been observed, namely:

1. *truncata* (W.). This form was found near Tunbridge Wells, Kent, by Mr Wollaston. It is a curious monstrosity, and proves permanent under cultivation. The apices of the fronds and with very few exceptions, those of the pinnæ also, are abrupt, and the end of the midvein projects nearly a quarter of an inch beyond the pinnules, giving the plant the appearance of having been eaten off in a uniform manner by some mollusk. The graceful outline and aspect of the plant are quite destroyed. In all other respects this variety resembles the normal plant.

2. *crispa* (M.). In this the pinnules are undulated or wavy, so that the frond has a crispy appearance. It was found by Dr Balfour, on the Clova mountains.

Lastrea Oreopteris.

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Plate XXIX

THE MARSH, or FEMALE BUCKLER FERN

(Lastrea Thelypteris).

LASTREA, *Presl*

Clusters of Spore-cases circular, medial or subterminal on the venules, covered by an indusium, or membranous scale. *Indusium* reniform, or more or less regular, rotundate with a posterior notch, attached by the sinus or notch, the margin becoming free. *Veins* simple, forked, or pinnate; *venules* direct, distinct at their extremities.

L. Thelypteris: fronds lanceolate with a broad base, pinnate; pinnæ linear-lanceolate, deeply pinnatifid, the lobes oblong, their margins revolute in the fertile fronds, which thus appear to have more acute contracted lobes; caudex creeping.

Lastrea Thelypteris, Presl, *Tentamen Pteridographiæ*, [illegible]. *Deakin, Florigraphia Britannica*, [illegible] 96. *Babington, Manual of British Botany*, 409. *Newman, History of British Ferns*, 2 ed. [illegible]. *Moore, Handbook of British Ferns*, 98. [illegible] 7.

Aspidium Thelypteris, Swartz, *Schrader's Journal für die Botanik*, 1800, [illegible]. *Smith, Flora Britannica*, 1 [illegible]. *English Flora*, [illegible] 272. *Hooker and Arnott, British Flora*, 569. *Mackay, Flora Hibernica*, [illegible]. *Schkuhr, Kryptogamische Gewächse*, [illegible]. *Willdenow, Species Plantarum*, [illegible]. *Sprengel, Systema Vegetabilium*, [illegible].

Aspidium palustre, *Gray, Natural Arrangement of British Plants*, [illegible].

Acrostichum Thelypteris, *Linnæus, Species Plantarum*, 1528. *Bolton, Filices Britannicæ*, 78, t. 43, [illegible].

Polypodium Thelypteris, *Linnæus, Mantissa Plantarum*, 505.

Polypodium palustre, *Salisbury, Prodromus*, [illegible].

Polystichum Thelypteris, *Roth, Flora Germanica*, [illegible].

Nephrodium Thelypteris, *Strempel, Filicum Berolinensium Synopsis*, 32.

Athyrium Thelypteris, *Sprengel*. *Steudel, Nomenclator Botanicus*, 64.

Thelypteris palustris, *Schott, Genera Filicum*, in note under *Nephrodium*.

Hemestheum Thelypteris, *Newman, Appendix to Phytologist*, 185[illegible]. *Also, History of British Ferns*, 124.

Dryopteris Thelypteris, *A. Gray, Botany of Northern United States*, 630.

EXPLANATION OF THE PLATE

Plate XXIX. Lastrea Thelypteris, from [illegible] Norfolk: *Rev. W. H. Gurdlestone*.

HABITAT. Though widely dispersed, the Marsh Fern is a comparatively rare plant, being local in its occurrence, and growing only in marshy and boggy situations, from some of which it is ordinarily being displaced by drainage. It is, however, generally abundant where present. In England it occurs from the southern counties to the extreme north, stretching east to Norfolk and west to Somersetshire. In Wales it is found both in the northern and southern divisions. Forfarshire is the only Scottish county known to produce it, and the records of its habitats in Ireland are few, though embracing all the provinces of that kingdom. It ranges from the sea level to an elevation of about 500 feet or upwards. We are indebted for an abundant supply of specimens from the fens of Norfolk and Cambridgeshire, to the Rev. W. H. [illegible], and the Rev. [illegible] Smith.

GEOGRAPHICAL DISTRIBUTION.—This Fern is found throughout Europe. It occurs in Asia, and a variety with a scaly rachis (*L. squamulosum*, Kl.) is found at the Cape of Good Hope and in New Zealand (*Hb. Hooker*). It is recorded as occurring in the Caucasus and the Altai range in Russian Asia; and a allied plant of large size, but probably not distinct as a species, has been gathered in Sikkim, by Dr. Hooker. The species seems to be not unfrequent in North America, though often confused there with the sufficiently distinct *L. noveboracensis*, the *Nephrodium thelypteroides* of Michaux.

Caudex extensively creeping, branched sparingly, producing fronds at intervals, slender, blackish brown, scaly at the growing point. *Scales* few, pale brown, ovate-lanceolate. *Fibres* numerous, dark brown, much branched, smooth or tomentose.

Stipes as long as or longer than the leafy portion in the fertile fronds, less elongated and slighter in the barren; smooth, rounded behind, channelled in front, the base ebony-coloured, pale green upwards. *Rachis* also smooth and channelled in front, the secondary rachides bearing a few small scattered scales, and loose spreading deciduous hairs; the latter also appear here and there on the veins beneath and along the margins of the lobes.

[illegible] alternate.

Frond from six or eight inches to four feet in height, including the stipes, and from about four to [illegible] branaceous, erect, pinnate, lateral and adherent to the caudex, the barren with seemingly broader leafy segments, the fertile with their segments apparently narrower and more acute, owing to the rolling in of the margin over or towards the sori. *[illegible]* numerous, sub-opposite or alternate, spreading, linear lanceolate, deeply pinnatifid. *Segments* oblong, obtuse [illegible] or slightly sinuate, the basal ones often longer than, and especially those on the anterior side quite distinct from, the rest. The fertile fronds differ in having the margins of their segments revolute, and in being taller with a stouter stipes.

Venation of the lobes consisting of a stout midvein, flexuous in the upper part, from which proceed alternate once or twice forked *veins*, the *venules* or *veinlets* running out to the margin. The veins are forked very soon after leaving the midvein.

Fructification on the back of the frond, occupying the whole surface. Sori small, round, situated near the base of the venules, *i. e.*, just above the fork of the vein, and forming a line on each side the midvein, and about equally distant from it and the margin, though apparently marginal from the involution of the edge of the frond; they are at first distinct, but often become laterally confluent, and sometimes effused over the whole of the small space between the rolled-up margins. *Indusium* a small delicate roundish membrane, attached posteriorly, lacerate and glandular at the margin. *[illegible]* numerous, brown, obovate. *Spores* oblong or reniform, strongly muricate.

Duration. The caudex is perennial. The fronds are annual, the barren ones growing up [illegible] May, the fertile in July, and destroyed by the frosts of autumn.

This plant may be distinguished from the other *Lastreas* by its habit alone, its long, comparatively slender, creeping caudex being unlike that of any of the other British species; but notwithstanding this, and the fact that its fronds are really quite unlike those of *L. Oreopteris*, the species has been confounded with that plant. It differs from it in having a long creeping caudex, whilst *L. Oreopteris* is tufted, and merely decumbent; in having its fronds of their full width almost to the very base, with a long bare stipes, whilst *L. Oreopteris* has diminishing pinnæ carried down almost to the base of the stipes; and in having fronds which are almost free from glands, whilst those of *L. Oreopteris* are very conspicuously resinose-glandular on the under surface, and very fragrant. It is still less like any others of the British Lastreas.

Lastrea Thelypteris is easily cultivated. It merely requires a light boggy [illegible] of soil, and abundant moisture. Out of doors it should therefore have a damp border, or should be placed in some wettish place about the fernery. In pots, it must have a very abundant supply of water; and the pots should be large and shallow, so that [illegible] spread [illegible] the surface. Peaty soil [illegible] mixed with a proportion of decaying leaves and light sandy loam will be congenial to it. It is increased readily by division of the caudex.

Lastrea Thelypteris.

PLATES XXX. XXXI. XXXII. XXXIII. XXXIV.

THE LADY FERN (ATHYRIUM FILIX-FŒMINA).

ATHYRIUM, *Roth*.

Clusters of Spore-cases oblong or sublunate, medial on the anterior side of the venules, the lowest anterior one usually, sometimes more or all arcuate or horse-shoe-shaped in consequence of their crossing the venule and returning along its posterior side, covered by a membranous scale. *Indusium* of the same form as the clusters, in the usual form of sorus opening along the side towards the midvein, and (in the British species) having the free margin split into capillary segments, at length reflexed. *Veins* forked or pinnate, *venules* disunited at their extremities.

A. **FILIX-FŒMINA**, fronds lanceolate, herbaceous, bipinnate, (sometimes subbipinnate or tripinnate), pinnules oblong ovate or lanceolate, sessile and distinct, or more or less decurrent and united, toothed or meso-pinnatifid with the lobes toothed, caudex tufted, erect or decumbent.

ATHYRIUM FILIX-FŒMINA, *Roth, Flora Germanica*, iii. 65. *Presl, Tentamen Pteridographiæ*, 98. *Babington, Manual of British Botany*, 4.9 (β). *Sowerby, Ferns*, 48. t. 23. *Newman, History of British Ferns*, 208. *Moore, Handbook of British Ferns*, 185 [illegible].
ATHYRIUM FILIX-FŒMINA, var. INCISUM, *Newman, History of British Ferns*, 214. *Sowerby, Ferns*, 44.
ATHYRIUM INCISUM, *Newman, Appendix to Phytologist*, 86; xiii. *History of British Ferns*, 214.
ATHYRIUM OVATUM, *Roth, Flora Germanica*, iii. 61. *Wall. Fl. Cryde* [illegible] (not of Newman).
ATHYRIUM LAXUM, *Schumacher, Enumeratio plantarum Sællandiæ*, ii. 18.
ATHYRIUM LATUM, *Gray, Natural Arrangement of British Plants*, ii. 10.
ATHYRIUM CYCLOSORUM, *Ruprecht, Beiträge zur Pflanzenkunde des Russischen Reichs*, 41.
ASPLENIUM FILIX-FŒMINA, *Bernhardi, Schrader's neues Journal fur die Botanik*, 1806, i. pt. 2, 26-27, t. 2, fig. 7. *Sprengel, Systema Vegetabilium*, iv. 88 (excl. syn. Poiret). *Hooker and Arnott, British Flora*, 574. *Mackay, Flora Hibernica*, 342. *Deakin, Florigraphia Britannica*, iv. 57 (incl. vars. *ovatum* and *incisum*). *Gray, Botany of Northern States*, 628.
ASPIDIUM FILIX-FŒMINA, *Swartz, Schrader's Journal fur die Botanik*, 1800, ii. 41. *Synopsis Filicum*, 59. *Schkuhr, Kryptogamische Gewächse*, 56, t. 58, 59. *Willdenow, Species Plantarum*, v. 276. *Smith, Flora Britannica*, 1124. *English Botany*, xx. t. 1459 (not good). *English Flora*, iv. 282.
NEPHRODIUM FILIX-FŒMINA, *Strempel, Filicum Berolinensium Synopsis*, 30.
POLYPODIUM FILIX-FŒMINA, *Linnæus, Species Plantarum*, 1551. *Bolton, Filices Britannicæ*, 46, t. 25 (bad). *Hoffmann, Deutschlands Flora*, ii. 6.
POLYPODIUM DENTATUM, *Hoffmann, Deutschlands Flora*, ii. 7.
POLYPODIUM [illegible], *Hoffmann, Roemer and Usteri's Magazin fur die Botanik*, 1790, pt. 9, [illegible] fig. [illegible]. *Deutschlands Flora*, [illegible].
POLYPODIUM OBLONGO-DENTATUM, *Hoffmann, Roemer and Usteri's Magazin fur die Botanik*, 1790, pt. 9, 10, fig. 13 a.
POLYPODIUM LATUM, *Salisbury, Prodromus*, 403.
POLYPODIUM FILIX-FŒMINA, [illegible] *Plantæ Cryptogamæ*, 315.

Less divided forms

POLYPODIUM MOLLE, *Schreber, Spicilegium Floræ Lipsicæ*, 70. *Hoffmann, Deutschlands Flora*, ii. 7.
POLYPODIUM FILIX-FŒMINA, β CRENATA, *Weiss, Plantæ Cryptogamicæ*, 315 (according to Roth).
ASPLENIUM FILIX-FŒMINA, var. MOLLE and var. TRIFIDUM, *Deakin, Florigraphia Britannica*, iv. 59.
ATHYRIUM MOLLE, *Roth, Flora Germanica*, iii. 61. *Newman, British Ferns*, 215 (excl. the [illegible] habitats).
ATHYRIUM FILIX-FŒMINA, var. MOLLE, *Newman, History of British Ferns*, 2 [illegible]. *Babington, Manual of British Botany*, 1 3 (γ). *Moore, Handbook of British Ferns*, 69. *Sowerby, Ferns*, 44.
ATHYRIUM [illegible], *Schumacher, Enumeratio Plantarum Sællandiæ*, 17.

POLYPODIUM OVATO-CRENATUM, *Hoffmann, Roemer and Usteri's Magazin fur die Botanik*, 1790, pt. 9, 10.
POLYPODIUM TRIFIDUM, *Hoffmann, Roemer and Usteri's Magazin*, 1790, pt. 9, 10. *Deutschlands Flora*, ii. [illegible]
POLYPODIUM [illegible], *Hoffmann, Roemer and Usteri's Magazin fur die Botanik*, 1790, pt. 9, 10.
ATHYRIUM TRIFIDUM, *Roth, Flora Germanica*, iii. 65.

Permanent monstrous forms

ATHYRIUM FILIX-FŒMINA, [illegible], *Moore, Handbook of British Ferns*, [illegible] ed. 4.
ATHYRIUM FILIX-FŒMINA, [illegible], *Steele, Handbook of Field Botany*, 2 5.
ATHYRIUM [illegible] of gardens.

ATHYRIUM FILIX-FŒMINA, [illegible], *Wollaston*, MS.
ATHYRIUM FILIX-FŒMINA, [illegible], *Moore, Handbook of British Ferns*, [illegible].

ATHYRIUM FILIX-FŒMINA, [illegible], *Moore, Handbook of British Ferns*, [illegible].
ATHYRIUM FILIX-FŒMINA, [illegible] of gardens.

Var. **RHÆTICUM**, fronds narrow-lanceolate, erect, pinnæ distant, pinnules distinct, deeply pinnatifid, lanceolate, acute, becoming linear from the incurvation of the

[illegible]

LATIFOLIUM [illegible]

MARINUM [illegible]

EXPLANATION OF THE PLATES

PLATE XXX. [illegible]

PLATE XXX. A, [illegible] B, [illegible] C, [illegible]

PLATE XXX. [illegible]

PLATE XXX. [illegible]

PLATE XXX. A, [illegible] B, [illegible] C, [illegible]

HABITAT. [illegible]

GEOGRAPHICAL DISTRIBUTION. [illegible]

Athyrium Filix-fœmina.

PRINTING.

A. Athyrium Filix-fœmina rhæticum
B. A. Filix-fœmina latifolium. C. A. Filix-fœmina marinum.

Canada and throughout the United States, where also occurs a [illegible] plant. *A. asplenioides*, of which *Asplenium angustum* is probably a smaller form differing [illegible]. Regarding *A. cyclosorum* from Petropaulowski, Unalaschka and Kamschatka, as well as from Iceland, [illegible] the same [illegible] compound forms [illegible] short [illegible]. In South America [illegible] forms which we refer [illegible] species, e.g. from Bourbon (*[illegible]*), from Cuba, and Vera Cruz (*[illegible]*). The forms from these foreign habitats are various, but are sometimes quite analogous to those which occur in this country, [illegible] resembling [illegible] in particular frequently occurring.

Caudex stout, erect or decumbent, sometimes elongated and trunk-like, often tufted, scaly at the crown. *Scales* lanceolate or ovate-lanceolate, dark brown, sometimes almost black. *Fibres* strong wiry, blackish, branched, the younger parts tomentose.

Stipes terminal, and adherent to the caudex, from about one-third to one-fourth the entire length of the frond, pale green or dull purplish red, stoutish, much thickened and assuming a kind of spindle-shape just above the base and considerably reduced in size at the extreme base, scaly; scales numerous on the lower part, lanceolate or linear, dark-coloured, varying from dark reddish brown to almost black, fewer and narrower on the upper part, often contorted. Rachis furnished sparingly with small narrow deciduous scales, channelled in front, rounded behind.

Vernation circinate. In the partially developed fronds the apex becomes liberated and bent downwards in a curve like that of a shepherd's crook.

Frond very variable in size, outline, and division, herbaceous, usually of a bright tender green, erect, spreading, or drooping. In the form we have figured (which is one of the most compound states of the *incisa* type) two to three feet high, and from nine inches to a foot broad; but often met with mature from one to two feet high, and from three to six inches broad, and not unfrequently nearly or quite five feet in height, with the longest pinnæ measuring ten inches. The outline is lanceolate, sometimes very broad, sometimes narrow; the less developed forms scarcely bipinnate, the pinnules being connected by the winged rachis, the more highly developed forms almost or quite tripinnate, the pinnules being distinct, and divided almost, or quite, to the midvein. *Pinnæ* numerous, opposite or alternate, more distant below, and often deflexed; sometimes approximate, sometimes distant above; linear-oblong, broadest at the base, gradually narrowing to a point, pinnate. *Pinnules* oblong, or ovate-lanceolate, obtuse or acute; sessile with a broad attachment, decurrent and confluent at the base, or with a very short narrowed stalk-like attachment; pinnatifid with shallow 2-3-toothed lobes at the base, and simple teeth towards the apex, or deeply pinnatifid throughout, with the lobes variously toothed—the teeth sometimes confined to the apices of the lobes, but in the more compound forms extending along their sides; the teeth are usually short and blunt-pointed, but sometimes narrowed and lengthened, though never normally bristle-pointed. The pinnules are sometimes merely patent, but frequently form a right angle with the secondary rachis and they are sometimes flat, the teeth lying in the same plane, or they become convex from the incurving of the teeth over the sori. In some forms there is no appreciable difference in the proportionate size of the lobes, but in others the lowest anterior lobe is considerably longer, giving an auriculate appearance to the pinnules, and forming a conspicuous line on each side the rachis of the pinnæ.

Venation of the pinnules in the less divided forms consisting of a flexuous midvein, producing alternate *veins* of which the lower are forked, with a *venule* directed into each tooth, and the upper are simple, directed into the simple teeth at the apex of the pinnules; in these the anterior venule of each fascicle bears the sorus along its anterior side. When the pinnules are more divided, the veins are pinnately branched, several alternate venules being produced, the number corresponding with the number of teeth; the anterior venule is here also soriferous, so that a line of sori are produced on each side the midvein, but in addition some of the other venules of the lower lobes bear sori. When the pinnules become very deeply divided, as in the most compound states of the plant, each of the veins produces several fertile venules, the sori then forming two lines along the lobes. The veins and venules terminate in a very slight attenuated point, just within the apex of the tooth, towards which they are directed.

Fructification on the back of the frond dispersed over the whole under surface. *Sori* numerous,

short, oblong or curved, indusiate, medial, usually occupying the anterior side of the anterior venules, in the less divided forms, and then straight, short oblong; the receptacle of the lower one, sometimes of more than one, crossing the venule, and forming a curved sorus, or also returning along the posterior side of the venule, and forming an arcuate or horse-shoe-shaped sorus. In the very much divided varieties, this curved form of sorus is more frequent, and sometimes it is even more abundant than the simple oblong form. In this latter state, the fructification may be readily mistaken for that of a *Lastrea*. The sori are at first distinct, but generally become more or less confluent by the spreading of the crowded spore-cases. *Indusium* membranaceous, the free margin cut into capillary segments. *Spore-cases* numerous, dark brown, obovate. *Spores* oblong, granulate or muriculate.

Duration. The caudex is perennial. The fronds are annual, appearing about May, and being destroyed by the first frosts of autumn or decaying early in the autumn, even when protected against frost.

The Lady Fern is not easily confounded with any other British Fern. Though related on the one hand to *Asplenium*, and referred to that genus by many talented botanists, it is at once distinguished from all the British *Asplenums* by its herbaceous texture, its annual fronds, and its whole habit, as well as by the curved or arcuate sori. On the other hand, these sori connect it in some degree with *Lastrea*, and it was no doubt the examination of specimens with advanced fructifications of this form which led to its being associated, as it was formerly, with *Aspidium*, but neither as it properly referrible to the *Aspidieæ* at all, nor is the plant sufficiently like any species of *Lastrea* to be mistaken for one of them.

The genus *Athyrium*, to which it is referred, is nevertheless one of doubtful character—not on the ground stated by Mr Newman—that Roth's typical species is *Asplenium fontanum*, and that we have no right to restrict the genus to the "Filix-femina or abnormal group," because that would be a palpable perversion of the author's meaning, for the fact of *Asplenium fontanum* occurring first in Roth's enumeration of the species, does not constitute it the type of the genus, but is clearly on account of its being the smallest and the simplest of the forms he proposed to bring together, Roth, moreover, in his generic character, expressly states of the indusium "margine laciniato-fimbriatum," which character belongs specially to the Filix-femina group, and does not well apply to *A. fontanum*. There need be no hesitation therefore about restricting Roth's *Athyrium* within the limits to which he himself points, and thus identifying it with the Filix-femina group. It is by taking a wider and more comprehensive view that the genus becomes doubtful. Both Presl and Fée unite *Allantodia* and *Athyrium* under the latter name, and characterise the group mainly by the short oblong gibbous sori, and vaulted indusia; but these marks pass imperceptibly into those of *Asplenium*, while the character afforded by the fringed indusia, on which Roth seems partly to have relied, is too trivial for the purpose of generic definition. The remaining character, that of the curved arcuate or horse-shoe-shaped sori, is certainly foreign to *Asplenium*, and indicates, as we have already stated, a tendency towards *Lastrea*. It is on this ground that we adopt the genus, from which the straight-fruited *Allantodias* should assuredly be removed to *Asplenium*. The effect of this, though it will doubtless reduce *Athyrium* very much, will not be to restrict it entirely to the forms of *A. Filix-femina*, a considerable number of distinct species from various countries having a similar fructification.

The Erect Lady Fern—A. Filix-femina erraticum (Plate XXXI. A) is generally distinguishable by its narrow erect fronds, and its distinct and apparently linear pinnules, which however owe their narrowed appearance to the inflection of the points of their lobes over the sori. The anterior basal pinnules are also conspicuously longer than the rest, as are the anterior basal lobes of all the pinnules. The caudex grows in tufts, and produces numerous fronds, which stand upright and have a rigid appearance, though in reality herbaceous, owing probably to the circumstance of their growing exposed, as is generally the case with this variety. The same cause, namely exposure, often produces more or less of convexity in the pinnæ. It occurs with the stipes—which is much thickened just above the base, as is generally the case in this species—either pale green or purplish red. The fronds grow from two to

RINTING.

Athyrium Filix-formina ovatum

four feet high with a narrow lanceolate outline. The pinnæ are distant, the lower ones most so, as well as deflexed, the majority however having an upward tendency. The secondary rachis is slender, and without any herbaceous wing, the pinnules being set on quite distinct from each other, and very commonly at a right angle with it, they are narrow, and have the appearance of being almost linear with the enlarged basal lobe quite evident. This narrowed appearance results from the recurving of the points of the narrow lobes into which the margin is divided, whence the pinnules become convex. The lobes are toothed. The sori are developed at the base of the lobes on the anterior sides of the venules, extending in two lines up the larger lobes. All the lobes however are so narrow, that they are necessarily very near together from the first, and become confluent as soon as the spore-cases begin to spread. This form or variety is no doubt general, it is known to occur in various places all over England, in North Wales, in both the Lowlands and Highlands of Scotland, and in the four provinces of Ireland.

Miss Wright's Lady Fern—A. Filix-fœmina latifolium (Plate XXXI. B.)—is a very remarkable looking variation, so peculiar indeed that Mr Babington was induced on his first acquaintance with it to consider it a distinct species. It is no doubt a marked variety, and as it is reproduced from the spores we cannot accept the views of those who regard it as a monstrosity. Its principal differences lie in the densely crowded condition, and unequal size, as well as uneven toothing or lacination of the pinnules, and in the situation of the sori. The fronds are three feet or more in height, elongate oblong-lanceolate, flaccid, and of a dark-green colour. The stipes and rachis are stout, the former of about the average length. The pinnæ are short, and distant below, approximate or even crowded upwards, irregularly linear-oblong in outline, with a tendency to become cuspidate at the apex. The pinnules are ovate, or oblong-ovate, blunt or sometimes acute, unequal, the anterior side being largest, flat, stalked, or at least having a narrow stalk-like attachment, overlapping, they are laciniate at the base, the lobes oblong and irregularly toothed, these lobes become smaller upwards, and eventually towards the apex merge into teeth, the teeth being usually but unequally taper-pointed. The veins are branched in the manner already described, and the sori are produced on the anterior side of the lowest anterior venule, but the vein becomes branched at a greater distance from the midvein than is usually the case, and thus the sori, which are small, are ranged in two distant lines about midway between the midvein and the margin. This variety was found by Miss Wright, near Keswick, in Cumberland, where but a plant or two was discovered. It does not appear to have occurred elsewhere. Our figure taken from a specimen of moderate size, kindly communicated by Mr F. Clowes, of Windermere, exhibits a curious sport in one of its pinnæ, in which the rachis has become elongated, so that the pinnules do not stand in the usual imbricated position.

Dickie's Lady Fern—A. Filix-fœmina Marinum—(Plate XXXI. C.)—is a small plant generally to be known by the exactly elliptic-lanceolate outline of its fronds and by its crowded oblong pinnules, which are connected at the base, and noticed with blunt shallow teeth, which latter in many fronds are mostly simple. The fronds are from a foot to a foot and a half long, spreading, or sub-decumbent, rigid, scarcely bipinnate. The upper pinnæ are spreading, the lower ones deflexed. The pinnules, largest next the rachis, are oblong, very obtuse, crowded, slightly overlapping, connected by a narrow wing, the margin rather toothed than lobed, the indentations being shallow, and the projection on the upper half seldom more than blunt simple or somewhat retuse notches, though below they are generally two or three cleft, and sometimes are deeper, as well as bifid nearly to the apex. The sori are lunate, or with a strong tendency to assume the arcuate or horse-shoe-shaped form, and are ranged in a double line along the pinnules, sometimes distinct, but often becoming confluent. It is with us a very constant and neat-growing plant, having the above-mentioned peculiarities, but we have seen fronds said to be produced by plants of this variety in which the pinnules were less blunt, and the lobes were deeper and bifid or trifid at their apex. It was originally found by Dr Dickie in a cave by the sea, in the neighbourhood of Aberdeen, and a plant almost exactly resembling it, has been recently gathered by Dr Alcock in the Isle of Man.

THE LADY FERN

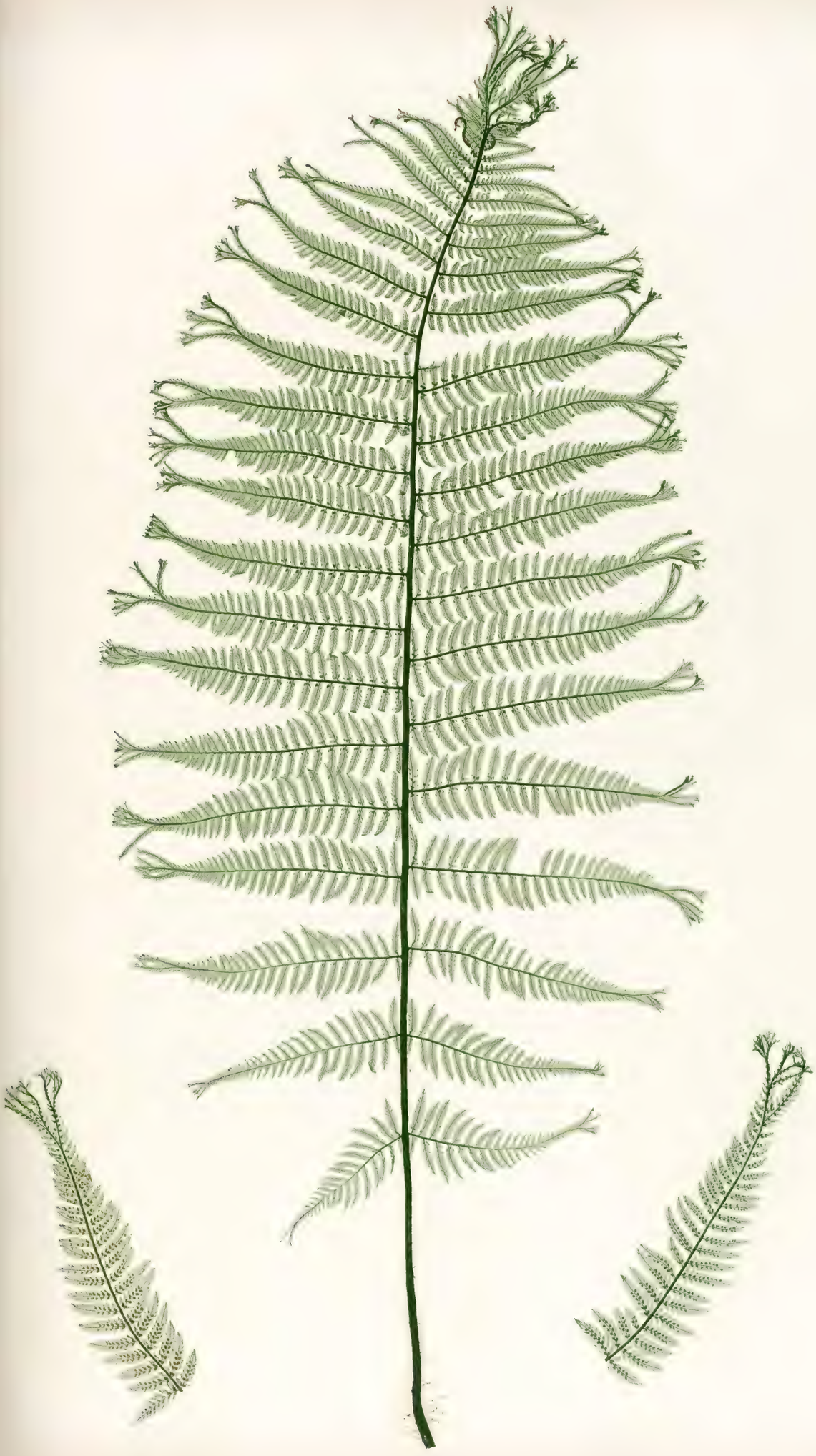
The different forms of Lady Fern are easily cultivated. All the larger ones grow readily in good light loamy or peaty soil, and like plenty of moisture, and for the most part shade and shelter. The variety *rhaticum* perhaps prefers exposure. The dwarf affiliated variety called *crispum*, and the smaller abnormal forms, are rather apt to sustain injury from too much confined dampness about the crowns in winter. The species in its varied phases may be considered one of the most beautiful of the larger deciduous native ferns.

Though attempting to enumerate for the use of cultivators, as well as for the information of botanists, the many forms in which the Lady Fern appears, we have not been always able to assign to them exact limits, for in many cases they pass by intermediate forms the one into the other. After, however, having for several years given much attention to this subject, we have come to the conclusion that there is more of permanence and constancy among them than is generally believed. We have rediscovered several recognisable forms, but with an increase of vigour, in the same situations after a lapse of six or eight years, so that the variations in those cases were at least not the result of age. We have removed others to the garden, and have not found them to vary beyond the acquisition of an increase of vigour under cultivation, and we have removed plants of the less compound forms from the open air to a shady greenhouse, without inducing any change of habit, or producing thereby even an approximation to the more compound forms. On the other hand some varieties, *rhaticum* especially, is reported to change under cultivation, but we have had no opportunity of experimenting with this form, which, as far as our observations go, owes its peculiar appearances to its growing naturally in exposed wet places, when removed to the shelter of a garden it no doubt becomes more lax, but even then we believe it may be identified. Every part of the plant—the scales, the stipes, the outline and direction of the frond, the form, attachment, and direction of the pinnules, and the size and position of the sori—is so liable to vary, that it is difficult to determine what peculiarities are of the highest value in endeavouring to set limits to the varieties, and after all, much reliance must be placed on differences which the eye detects but which the pen fails to record. For this reason especially, few of the forms below enumerated are considered to have any other botanical importance than that of proving the variability of what are called species. We have, however, thought it better to notice all that were known to us, than to cast the most puzzling aside as 'diseased or malformed,' or 'not having any botanical existence.' The testing of the constancy or inconstancy of the forms of such variable plants as the present, with patience and perseverance under fair conditions of culture, is worthy the attention of those Fern-growers who have space for the experiments. The enumeration which follows, of the modifications of form occurring amongst our native Lady Ferns, is enriched by many notes and memoranda from Mr Wollaston.

1. *confluens* (M.). A very remarkable form, found by Mr A. Tait, of Edinburgh, "on the seam of a perpendicular rock, on the side of one of the pine-covered mountains near Dunkeld," in 1853. It has a peculiar rigid erect appearance. The original fronds were about nine inches high, but the plant has not recovered the effects of its removal, which was effected with difficulty. The pinnæ are about an inch long, the basal pinnule distinct, with shallow two or three-toothed lobes, the rest crowded, confluent at the base, pinnatifidly lobed with distinct blunt teeth. In the original fronds these confluent pinnules were considerably reduced in size.

2. *latifolium* (Bab.). Mr Wollaston's notes on this variety already described above are as follows. The fronds are ovate-lanceolate, subpinnate, the lobes of the pinnules being cut almost to the midvein, the stipes is short, and but thinly clothed with scales. The pinnæ are alternate, approximate on the upper part of the frond, distant below, linear-lanceolate. The pinnules, which are crowded and overlapping, are stipitate, ovate, and deeply and irregularly incised. It is a very graceful variety and easy of cultivation, but retains its abnormal character best in the open air.

3. *incisum* (M.). Of this Mr Wollaston makes as follows.—This variety differs essentially from



RINTING.

Athyrium Filix-femina multifidum.

the common forms of the species in being nearly prostrate and very rigid. The scales, which thickly clothe the lower portion of the stipes, are of an intense brown colour, almost black. The fronds, which are sub-bipinnate, vary much in size, and are exactly lanceolate, the shortening of the pinnæ from the centre of the frond being equal, both towards the apex and the base. The pinnæ taper but little from the rachis for two-thirds of their length, and from thence into a somewhat acuminate point. The pinnules are crowded and overlapping, oblong and blunt, and simply notched.

4. *stenodon* (M.). A very elegant form of small size, varying from one foot to a foot and a half in height. The pinnules are united by a narrow wing along the rachis, and are approximate, linear oblong, pinnatifid with toothed lobes below, simply toothed above, the teeth conspicuously narrow, regular and somewhat elongated. The rachis is pale dull red. It has been communicated from Ilfracombe, by the Rev J. M. Chanter, and from Gomshall, by Mr E. Morse. The scales are pale tawny brown, but in a closely allied plant, from Devonshire, they are black. The fine elegant toothing is remarkable.

5. *acuminatum* (M.). A very curious dwarf variety, gathered on Snowdon, by Mr W. Pamplin, and constant under cultivation. It has a short stipes, with narrow contorted scales, fronds rather more than a foot high, and somewhat crowded pinnæ, ending in a longish serrated acumen. The pinnules are distinct, but decurrent, oblong but often narrowed below, crowded, patent, pinnatifid below, and cut around the blunt apex into longish acute teeth. It is altogether a slender-looking and elegant plant. Mr E. J. Lowe has sent a similar form from Clitheroe, Lancashire.

6. *excurrens* (M.). The general appearance of this plant is that of *molle*, but the points of the pinnæ, and sometimes of the pinnules and teeth, run out into diaphanous hair-like points, which have the appearance of being an excurrent growth of the veins. It was found at Tunbridge Wells in 1853, and is cultivated by Mr Wollaston. A similar variety has been found near Ilfracombe by the Rev J. M. Chanter.

7. *pruinosum* (M.). This resembles the moderately developed growths of *molle*, but has the stipes and rachides covered with small glands, which give them a hoary appearance, somewhat resembling pubescence. It occurs with both red and green stipes. The form, with red stipes, we found at Tarbet in Dumbartonshire, and a very similar plant was gathered by Dr Allchin in the Isle of Man. Another state, rather more lax, and with pale green stipes, has been found by Dr. Allchin at Virginia Water, Surrey.

8. *odontomanes* (M.). A small form, growing from a foot to a foot and a half high. It has broadly lanceolate fronds, short broad acuminate pinnæ, and rather distant patent pinnules, decurrent at the posterior base, deeply pinnatifid, the lobes toothed with elongated or linear acute irregular teeth. The most marked form was sent from Comstone, by Miss S. Beever. We have analogous forms as well as others closely akin but narrower, found in Denbighshire by Mr Pritchard, at Virginia Water and in the Isle of Man, by Dr Allchin, and by ourselves at Glen Croe, in Argyleshire, and Tarbet, in Dumbartonshire. It may be regarded as a long-toothed and usually small often narrow, form of the *molle* group.

9. *molle* (Roth). The form, which we consider to be the *A. molle* of Roth, is a small plant of from one to two feet high, lax with rather distant pinnæ, the pinnules oblong bluntish, having a broad attachment, and more or less obviously connected at the base by the narrow wing of the rachis, they are pinnatifid, the lobes oblong, and the lowest two or three-toothed, the rest notched or simple. The larger states of this form, in which the pinnules become more distant, rather less conspicuously united at the base, and rather more deeply toothed, correspond with a specimen of the *Polypodium molle* of Schreber, preserved in Sir J. E. Smith's herbarium. We believe it is not at all an uncommon plant, but it is met with under several conditions differing in size, and in the degree of toothing, and of confluence in the pinnules, the larger forms merging into *trifidum*.

10. *trifidum* (Roth). This is a larger plant than *molle*, with more distinct pinnules, the latter of an oblong lanceolate form, rather larger at the base on the anterior side, and cut half way to the midrib into lobes, the majority of which in the typical states, are entire at the edges, and three-lobed at the

apex. The sori are near to the midrib, and often become confluent. It is a common plant. Possibly it may be the more highly developed condition of some of the commoner small pinnæ referred to *molle*, or it may be a less developed state of the *incisum* group. We believe, however, that some at least of the forms referred above to *molle* and *odontomanes*, are permanently distinct from the more divided forms representing the *incisum* and *rhæticum* groups.

11. *ovatum* (Roth). This is more readily identified from being figured by Milller. It grows from two to three feet high, with broad lanceolate fronds. The pinnules are ovate-oblong, narrowed out obtuse at the points, flat, largest on the anterior side, deeply pinnatifid, the toothing of the lobes not confined to their apices. The sori are placed in two lines near the midrib, and a tendency is shown to develope more than one on the basal lobes. It does not appear to be very frequent.

12. *obtusum* (M.). This has broad fronds, about two feet high, the leafy portion about half as broad as long. The pinnules are flat, distinct, obliquely and very obtusely ovate-oblong, somewhat decurrent behind, cut into a few broad variously-toothed lobes, the teeth short and blunt-ish. It has somewhat the appearance of blunt pinnuled forms of *Lastrea dilatata*. The sori form two lines nearer the midrib than the margin. It was found at Virginia Water by Dr. Allchin.

13. *frondosum* (M.). This is a larger and more compound state, two to three feet high, with broad lanceolate fronds, and broad approximate pinnæ; the fronds having a more crowded leafy appearance than usual. The pinnules near the centre of the frond are sometimes seven-eighths of an inch long, and fully three-eighths in breadth, pyramidal, pinnatifid nearly to the midrib, the lobes oblong toothed, and the lower ones bearing several sori, in which the tendency to become arcuate is strongly marked, that nearest the midvein of the pinnule, on each lobe, being uniformly horse-shoe-shaped. The stipes and rachis are red in plants we have met with at Mayford. A very similar form has been sent us from Denbighshire by Mr. Pritchard, and another form which belongs here also, has been sent by Mr. E. J. Lowe.

14. *decultoides* (W.). This singular aberration from the normal form was discovered in 1854, near Castle Kelly, in the county of Dublin, Ireland. Dr. Knowan, its discoverer, describes the pinnules to be pinnatifid, "the indentations entire at their edges, and bearing the sori in the angle." The sporecases project beyond the edge of the frond, which, added to the bulging forwards of the substance of the pinnule, gives the plant much the appearance of a Davallia, though of course differing from that genus in the shape and position of the indusium, the segments bear but a single very small sorus. It is very rare, and only known to us from the above memoranda, communicated by Mr. Walkston.

15. *incisum* (Hoffm.). This represents the species in its highest state of development, the pinnules being so deeply divided that the fronds become almost or quite bipinnate. Usually it is a large growing plant with broad drooping feathery fronds. In one example now before us, gathered in the county Clare, Ireland, by Mr. B. Barrington, the height is about five feet, and the breadth one foot, the pinnæ which are ascending being quite nine inches long, and the pinnules an inch and a half long and five-eighths of an inch wide at the base. Three to four feet is not an uncommon height for this variety, which puts on many appearances, and in one or other of its conditions is not infrequent. A form of it less common, has the divisions of the pinnules more narrowed and distinct than usual, but equally deeply cut, as represented in PLATE XXX., which is perhaps the most elegant state of this really graceful species.

16. *laxum* (Schum.). This is like the last in being a large broad much divided form, but in well developed states it is even more lax in habit. Its peculiarity consists in the very conspicuous elongation of the anterior basal lobe of the long narrow pinnules, which form a line on each side the midrib. It first attracted our notice in specimens from the neighbourhood of Shrewsbury, in the collection of the Rev. W. A. Leighton, and we have since received it from many localities in the three kingdoms so that it does not appear to be an accidental condition, but a distinct and permanent form. It accords with Schumacher's description of his *Athyrium laxum*. The prolongation of the anterior lobe into a kind of auricle indicates an approach towards the variety *rhæticum*, in which the same kind of elongation is manifest, but all our specimens are much broader and more lax than the latter plant. We may add

A. Athyrium Filix-fœmina crispum.
B. A. Filix-fœmina depauperatum. C. A. Filix fœmina dissectum

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that in all the compound forms of Lady Fern the anterior basal lobes are longer than the rest, but what occurs in this variety is an exaggerated and more manifest elongation.

17. *rhæticum* (Linn.). This in its normal state, as already stated, is peculiar on account of its narrow erect fronds, its ascending pinnæ and linear-lanceolate pinnules, which are rendered still more apparently linear by the incurving of the points of the lobes. It has the prolonged anterior basal lobe. We have had no opportunity of testing the effect of growing this plant in shade, but we should suspect it would be to produce a resemblance to the last, and this appears to be really the case, for we learn from Mr Wollaston, that when grown as a pot plant in the greenhouse, it with him invariably assumes the appearance of the less developed states of *incisum*. The form is not uncommon in exposed boggy places, and two or three states of it occur, one which Mr D Moore informs us is not uncommon in Ireland, has shorter but equally distinct pinnules, and the same erect habit. It also occurs with the stipes and rachis either red or green. *Asplenium irriguum* is no doubt a small state of the green form of this variety, and is perhaps permanently smaller.

18. *dissectum* (W.). This, and the following, are more or less of an abnormal character. This has fronds scarcely exceeding a foot in height, broadly oval, and of very irregular development. The pinnæ are unequal, the pinnules rather distant, decurrent, unequal in size and irregular in form, but for the most part ovate-oblong, blunt, and cut into distant unequally-toothed lobes. Mr. Wollaston remarks, "It bears some analogy to *præmorsum*, being irregularly jagged both in the pinnæ and pinnules, but it is of the usual size and fertile. It might be described as a full-grown, fully developed fertile *præmorsum*. It is beautifully lax and elegant in its habit. The pinnules are decurrent and deeply and irregularly incised. It was found by Dr. Young in Ireland, and is rare and constant in cultivation." A plant lately found by Mr S. Jervis of Darlaston Hall, Staffordshire, in that neighbourhood, is very similar, and others found by ourselves at Tarbet, and by Dr Allchin in the Isle of Man, are analogous, but not quite identical.

19. *præmorsum* (M.). This curious dwarf and as yet barren form "was found by Dr Dickie on Ben-na Muich-dhu, at an altitude of 3700 feet, in 1846, and has since that time proved constant under cultivation. The fronds, which rarely attain a height of eight inches, are of an irregular ovate-lanceolate outline. The pinnæ are unequal, and the pinnules are oblong and decurrent, lacerate, and irregular, as if they had been partially eaten by an insect. It is exceedingly rare. It is possible this form may belong to *Polypodium aspectre*.

20. *irregulare* (M.). A curious variety, in which the pinnæ are distant, furnished in their upper half with linear-lanceolate incised pinnules three-fourths of an inch long, those on the lower half, except the basal anterior one, which is long and narrow, very much though irregularly shortened, frequently roundish or fan-scaped and pinnatifid, with serrated lobes, intermixed with longer ones. It has been found by Mrs. Rogers in Belvoir Woods, Rutlandshire, in 1854, and similar plants have been met with by Dr Allchin at Virginia Water, Surrey, in Black Park, Buckinghamshire, and in the Isle of Man.

21. *laciniatum* (M.). A very pretty small form found near Nettlecombe, in 1853, by Mr Elworthy, and since quite constant in cultivation. The outline is irregular, some of the pinnæ being caudate, others præmorse, and some quite short. The pinnules are decurrent, variable in size and form, and very irregularly laciniated, the sori numerous and crowded about the base of the lobes.

22. *abruptum* (M.). A singular monstrosity, with somewhat the aspect of *marinum*. The fronds are variable in form; those which are most marked have the pinnæ, which are crowded, partially depauperated, roundish, or transversely oblong, and unequally cut into coarse lobes or teeth, the few pinnules here and there, which bear something like a normal character being bluntly oblong with broad shallow-toothed lobes. At the apices of most of the pinnæ one or two of the pinnules are larger, and the normal gradually tapering apex is wanting, which together with the dilatation of the

apex of the fronds give them an appearance of peculiar abruptness. Sometimes the frond is narrower the apex lengthened out, and here and there the pinnæ are terminated by a somewhat elongated pinnule set endwise, the rest terminating abruptly. Occasionally a normal frond is produced, which may be compared to those of *molle*, but with the pinnules narrower and more deeply lobed, whilst the lobes are smaller and more finely notched. This was found by Dr Allchin at Port Erin, in the Isle of Man; and in the same island another somewhat larger plant, closely related to the normal frond above described, was met with.

23. *incurvatum* (W.). This form partakes much of the characteristics of *ramosum*, but is sufficiently distinct from it. The fronds rarely branch except near the summit, and there are only simply bi- or tri-furcate. The pinnæ vary considerably in this respect, being remarkably variable in length, shape, and division; their apices are almost always divided simply or multifidly and the serratures of the pinnules are generally deeply and acutely cut. There are two slight modifications of this variety, one raised from seed by Mr. J Young [illegible], Somerset, and [illegible] found in a batch of seedling plants at Ambleside, [illegible] by Mr W[illegible]. Both are rare and curious.

24. *ramosum* (W.). This, unlike most of the other forms [illegible] [illegible] [illegible] frequently [illegible] tions being very unequal. The pinnæ are, so to speak, of every possible form and length, those on one division of the frond being normal whilst on another some are long, some short, [illegible] interrupted, depauperated, laciniated, abortive, or often altogether wanting. The pinnules have the [illegible] symmetrical development, their serratures being either one, two, or three-cleft on the same pinnule. It is sparingly fertile, and permanent under cultivation. It was found by Mr W W Reeves near Tunbridge Wells, Kent.

25. [illegible] (W.). This form differs from *præmorsum* in being of the usual size, and fertile, and [illegible] so abundant and large that they are almost confluent. The outline of the frond is normal, and the same may be said of the pinnæ, but they are somewhat depauperated. The pinnules are very irregularly laciniated and toothed, and (what is very unusual) are frequently bifid or multifid. It was found near Tunbridge Wells, Kent, by Mr Wollaston; and a very similar form has been found by Dr Allchin at Caher Conree, in Ireland. Another plant, somewhat more regular and normal-looking, with a tendency to [illegible] the points of the pinnules, was gathered in 1855, by Dr Allchin, in the Isle of Man.

26. *polyclados* (M.). Under this head we include several large much-divided ramose forms found in Devonshire and Guernsey. They are indescribable, no two fronds being alike in their divisions. One before us from Devonshire, [illegible] by the Rev. J. M. Chanter, is three-branched, the branches bipinnate [illegible] sometimes bifid; the pinnules irregular in size, shape, and division. Another from Guernsey, sent by Mr C. Jackson, has the pinnæ excessively developed, and becoming branch-like in the middle of the frond, while those at the base as well as apex appear [illegible] arrested. The pinnules on the larger pinnæ are often an inch and a half long, quite again pinnate, the secondary pinnules pinnatifid with [illegible] lobes.

27. *[illegible]dactylon* (M.). This is a monstrous plant of the *incisa* type, with flat, ovate, lanceolate pinnatifid pinnæ. Its peculiarity consists in the apices of the pinnæ being furcately divided into [illegible] normal-looking—not crisped—points; in other words, they are plane, and bi- or tri-furcate at the tips. The apex of the frond is also several times forked. It was found near Nettlecombe by Mr C. Elworthy, to whom we are indebted for a frond. We learn from Mr Elworthy that [illegible] the fronds of this variety to perish six weeks earlier than those of the somewhat [illegible]

28. *furcatum* (M.). This is a furcate monstrous form of one of the less divided types. The ends of [illegible] the tips; and the apex of the

frond is divided into a short tassel. It was found near Ilfracombe, by the Rev J M Chanter, and is, we learn, constant

29. *multifidum* (M.), *cristatum* (W.). This is the most beautifully symmetrical yet monstrous—and graceful permanent variety which has yet been found, equally beautiful and exactly analogous with the variety *cristata* of the Male Fern. Its habit corresponds exactly with the usual form of the plant, but it differs in having the apices of the frond, pinnæ, and (in well-grown plants) the pinnules most exquisitely tasselled or divided into a lash of branches. The tips of the pinnæ are in fact many times dichotomous, with the apices dilated and incised. It belongs to the *rhæticum* group. Mr Wollaston suggests, with a view to uniformity in the names of corresponding varieties, that this ought to be called *cristatum* on account of its similarity to the crested form of the Male Fern, but it seems impossible without continually changing the names in use to arrive with exactness at this uniformity so that Fern-cultivators should adopt the rule which botanists have established on this point, and avoid mere changes. Our plate of this variety necessarily represents a small specimen, when large and at the same time well grown, it is far handsomer. This form was found near the Seven Churches, in Wicklow Ireland, by Mr D Moore, in company with Mr Newman, and it or similar forms have also been reported to have been found in Clare, by Dr Kinahan, and in Killarney by Mr Ogilby

30. *depauperatum* (W.), *ramosum* (M.). A remarkable monstrosity which, though it somewhat resembles the last, differs from it essentially in its mode of unsymmetrical development. The apex of the frond is much more deeply lacerated or split up into numerous corymbiform tassels. The pinnæ are also tasselled, depauperated, laciniated, and irregular and the pinnules very irregular, bluntly toothed and frequently altogether wanting. The sori are frequently abortive. It is an exceedingly rare variety and was found, it appears, many years since, by Mr J Gunning (at that time foreman in the Dublin College Botanic Garden), near Ben Bulben in Sligo, Ireland. Cultivators owe its distribution to Dr Mackay

31. *crispum* (M.), *Smithii* (Hort.). This singular variety has more the appearance of a tuft of fine curled parsley than of a Fern. It is of slender and dwarfish habit, and the fronds are ramified in every possible way, the rachis being divided very irregularly, and each apex densely tufted. The pinnæ and pinnules are very unsymmetrically laciniated, and frequently wanting for a long portion of the stipes. The fructification is generally abortive, as in the last, but, as in that, not always so. It was originally found by Mr A. Smith "on the Hill Orah" Antrim, Ireland, subsequently in Corrymuzie Lynn, Braemar, Scotland, by Sir W C. Trevelyan, and recently at Todmorden Lancashire, by Mr J Haddart

To this species, and possibly to the variety *rhæticum* belongs a plant "gathered on ye mountains of Mourne, in ye county of Down," by Sherard and now preserved in the University Herbarium, Oxford It is the *Asplenium Adiantum-nigrum β* of Sir J E Smith, and is referred to *Asplenium acutum* by Mr. Newman! Sir J E. Smith correctly describes it as of a delicate membranous texture, the leaflets finely laciniate and without fructification. We are indebted to Mr M T Masters, sub-curator of the Fielding Herbarium, for a photograph of Sherard's plant, which leaves no room for doubt that it is an Athyrium. It is assuredly not at all like *Asplenium Adiantum-nigrum*, or *Asplenium acutum* The frond is about a foot long, linear-lanceolate, bipinnate, with narrow oblong pinnæ, of which it would appear that the veins are more perfectly developed than the parenchyma, hence the appearance of being palmately laciniate. It is just such a state as might be expected to be produced in a dark cave, in which this is said to have grown

In addition to the forms above enumerated many other [illegible] have been met with both in the normal and monstrous state, we may especially refer to the 'gatherings' of Dr Allchin, in the Isle of Man of the Rev J M. Chanter, in Devonshire, of Mr Wollaston in the Lake District and of Mr Clapham, in Yorkshire. These however have been too recently obtained to admit of

[illegible] species [illegible] forms [illegible] [illegible] [illegible] to the usual [illegible] [illegible]. W[illegible] [illegible] or [illegible] may appear that among [illegible] species [illegible] to those we have referred with tolerable certainty to the [illegible] above [illegible] there are many others which could not be satisfactorily placed. [illegible] long series of gradations representing species. One can scarcely imagine [illegible] Ferns more [illegible] of the [illegible] groups, or the forms represented in [illegible] plates XXX and XXXI. [illegible] Or [illegible] such [illegible] as a species among plants but ever-changing varieties [illegible] of individuals [illegible]. [illegible] "species" to be considered [illegible] as a group of [illegible] more or less alike, having certain marks in common, brought together [illegible] for the convenience of [illegible] as certain [illegible] species are collected together in the same way, and for the same purpose, [illegible] groups called genera. The [illegible] study of Ferns would be scarcely likely to produce [illegible] negative to this question.

Plate XXXV a

THE SMOOTH ROCK SPLEENWORT
(Asplenium fontanum).

ASPLENIUM, *Linnæus.*

Clusters of Spore-cases linear, oblong or elongate, straight, attached along the inner or anterior side of the veins or venules, furnished with an indusium or membranous cover. *Indusium* of the same form, entire or somewhat jagged on the margin, opening along the inward side, or that towards the midvein or axis of venation. *Veins* [illegible] at their extremities, their branches (*venules*) simple or forked, sometimes furcately branched without a midvein.

A. fontanum, dwarf, fronds linear-lanceolate, broadest upwards, rigid, glabrous, bipinnate; pinnæ oblong-ovate; pinnules small obovate-cuneate, with a few large, angular, pointed teeth; rachis narrowly winged throughout; sori short oblong.

Asplenium fontanum, *Bernhardi, Schrader's neues Journal für die Botanik*, 1806, i., part [illegible], 26. *Smith, English Flora*, iv. 253. *Hooker and Arnott, British Flora*, 57[illegible]. *Deakin, Florigraphia Britannica*, iv. 62. *Moore, Handbook of British Ferns*, 56. *Sowerby, Ferns*, 45, 26. *Brown, Prodromus Floræ Novæ-Hollandiæ*, [illegible]. *Sprengel, Systema Vegetabilium*, iv. 86. *Sadler, Filices Hungariæ*, [illegible].

Asplenium [illegible]. *Sprengel, Systema Vegetabilium*, iv. 88. *Sadler, Filices Hungariæ*, 27. *De Candolle, Flore Française*, v. 246.

Polypodium fontanum, *Linnæus, Species Plantarum*, 1559. *Smith, Flora Britannica*, [illegible]. *Bolton, Filices Britannicæ*, 38, t. [illegible].

Polypodium alpinum, *Lamarck, Flore Française*, [illegible] 22.

Aspidium fontanum, *Swartz, Schrader's Journal für die Botanik*, 1800, ii. 40. *Synopsis Filicum*, 57. *Willdenow, Species Plantarum*, v. 272. *Schkuhr, Kryptogamische Gewächse*, 52, [illegible]. *Smith, English Botany*, xxx. t. 2024.

Aspidium [illegible]. *Willdenow, Species Plantarum*, [illegible].

Athyrium fontanum, *Roth, Flora Germanica*, iii. 59. *Sadler, Adumbratio [illegible] Hungariæ*, 20. *De Candolle, Flore Française*, ed. 3, ii. 557. *Presl, Tentamen Pteridographiæ*, 98. *Babington, Manual of British Botany*, [illegible]. *Gray, Natural Arrangement of British Plants*, [illegible] 10. *[illegible], Genera Filicum*, [illegible].

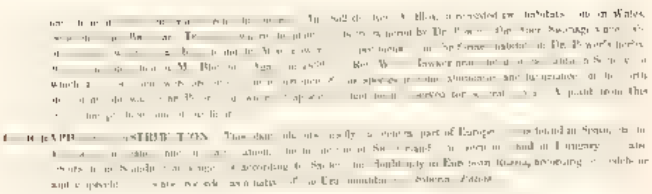
Athyrium [illegible]. *Roth, Flora Germanica*, iii. 60. *Presl, Tentamen Pteridographiæ*, [illegible]. *[illegible] Genera Filicum*, [illegible].

EXPLANATION OF THE PLATE.

Plate XXXV a.—Asplenium fontanum, 1, from Petersfield, Hampshire: *Rev. W. H. Hawker*. 2, from Tooting, Surrey, cultivated: *Chelsea Botanic Garden*. 3, from the Swiss Alps: *J. Atkins*.

Habitat.—This rupestral and mural species is one of our rarest native ferns, and is, indeed, considered by many botanists as [illegible] true that it has lately been found only in situations which may seem to support this opinion, but on the other hand there are positive statements of its having been found in a wild state [illegible]. Moreover, while so many probable situations for it remain unsearched [illegible] we are [illegible] in concluding that it does not [illegible] state [illegible] the search had been much more complete [illegible]. We are, therefore [illegible] Flora [illegible] first records our plant as a native, and gives as stations Amersham Church, and [illegible], Westmoreland; from the former of which, according to Sir J. E. Smith, it was brought alive to Kew Gardens by the late Mr. Aiton. In Lightfoot's herbarium, as we learn from Sir W. J. Hooker's account (*Journal of Botany*, [illegible]) [illegible] which are fastened specimens of this species, is the following sentence written by Lightfoot himself: "This [illegible] gathered on Amersham Church, Bucks [illegible] Fountain Polypody [illegible] to grow on old walls and rocks, about Amersham Church [illegible] Westmoreland. The specimen here figured and described was sent to [illegible] by a gentleman who gathered it in Buckinghamshire [illegible] Sir W. J. Hooker [illegible] remarks [illegible] [illegible] Brown [illegible] the Botanical Society of London are specimens [illegible] to have been gathered in [illegible] on rocks at [illegible] by Mr. Borrer [illegible] Mr. [illegible] [illegible]

THE SMOOTH ROCK SPLEENWORT



Caudex short erect, tufted, scaly. *Scales* subulate, dark brown, semi-transparent, the tissue striate with elongate parallel cells. *Fibres* slender, branched dark brown, tomentose.

Stipes slender, dark purplish brown at the base, becoming green upwards, usually about one-third the length of the frond, furnished at the base with a few very small deciduous scales, terminal and coherent to the caudex. *Rachis* green, with a narrow elevated margin or wing throughout, the margin extending nearly to the base of the stipes.

Vernation circinate.

Fronds averaging four or five inches in length, varying from about two and a half to ten or twelve inches, rigid, dark green, smooth, erect or spreading, narrow-lanceolate, broadest above the middle, bipinnate. *Pinnæ* oblong-ovate, spreading, the lower ones smaller, palmately three-lobed and more distant, the uppermost ones oblong, and more crowded. *Pinnules* roundish obovate, tapering to the base, the lower ones distinctly stalked on the narrowly-winged secondary rachis, the upper more decurrent, their margins deeply notched, with from two or three to five or seven coarse, angular, spinosely-mucronate teeth.

Venation of the principal pinnules consisting of a flexuous midvein, sending off alternate simple veins, one of which is directed towards each tooth, and extends almost to its apex.

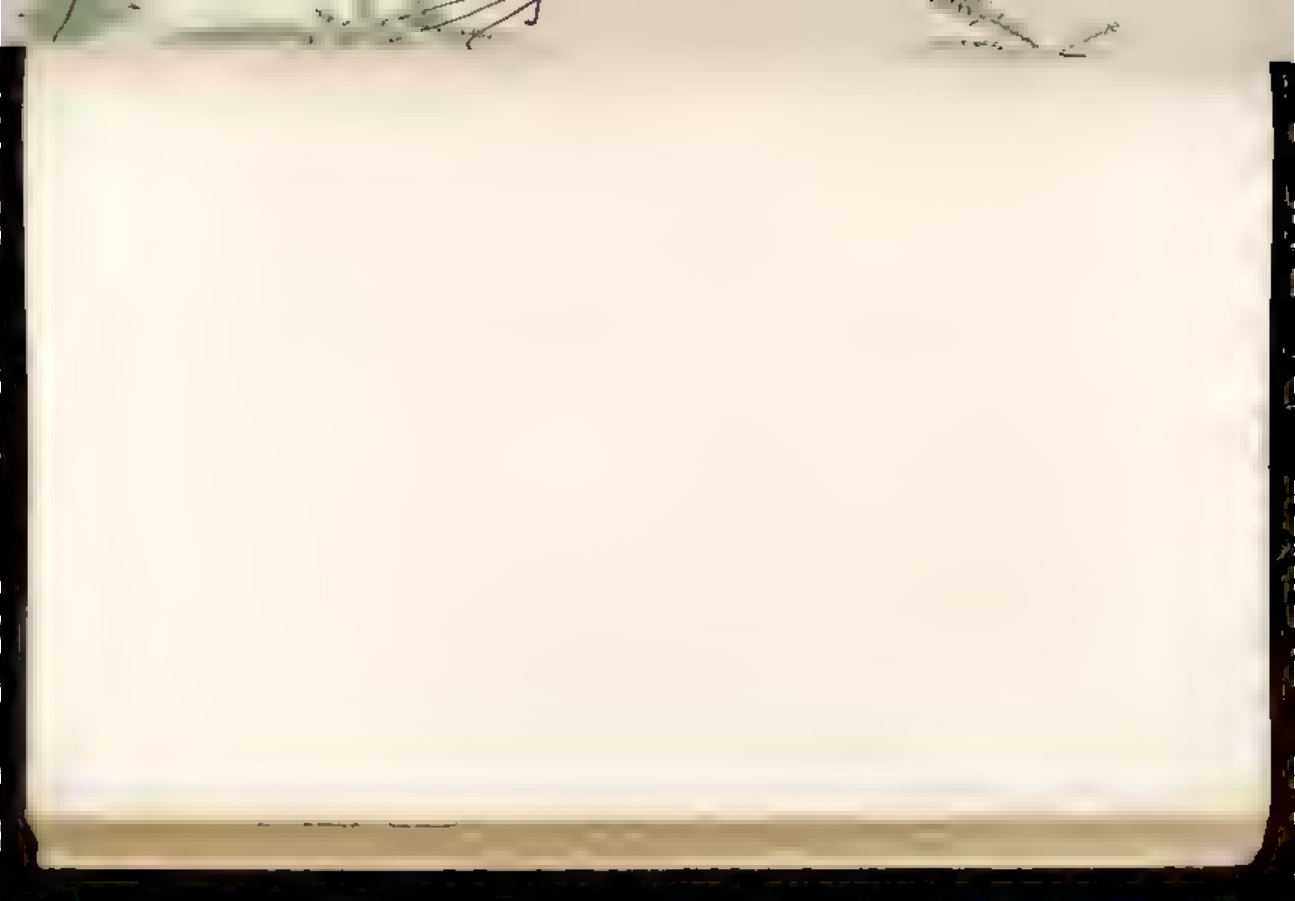
Fructification on the back of the frond, most copious upwards, but extending nearly to the base. *Sori*, or clusters of spore-cases, small, short oblong, from two to four on each pinnule, attached near the base of the veins on their anterior side, at first distinct, but often becoming confluent and forming large shapeless masses over the centre of the pinnules, immersate. *Indusium* short oblong, white, usually straight behind, sometimes a little curved, rounded, entire, and sometimes slightly wavy on the free margin. *Spore-cases* small, roundish. *Spores* angular, rough.

Duration. The caudex is perennial. The fronds are also persistent, the plant being evergreen, and continuing in growth the whole year, under favourable conditions.

This Fern is readily known among the British *Asplenieæ*, by its bipinnate fronds, taken in conjunction with their small stature, and the smallness of their parts, six inches in length for the frond, and half an inch for the pinnæ being rather above the average growth. Apart from this discrepancy in size, it very much resembles *A. lanceolatum*, the structure of its parts being nearly identical, but in the latter the lower pinnæ do not diminish in so marked a degree.

Some botanists continue to place this species in *Athyrium*, as originally proposed by Roth, but the plant is too nearly akin to *A. lanceolatum* to be separated from it, and the general structure of its sori is asplenoid not athyrioid. There is occasionally manifested a very slight tendency to produce the arcuate sori characteristic of *Athyrium*, but this does not occur in a sufficient degree to necessitate the removal of the species from *Asplenium*, with which in all other respects it so exactly accords.

It is an easily grown frame or greenhouse Fern, particularly desirable in a small collection from its small size and evergreen habit. It should be potted in well-drained, porous soil, composed of turfy peat, with a small proportion of loam, and abundance of sand. The crown of the plant may be advantageously raised somewhat above the general surface in potting, by being wedged between [illegible]



HNTING.

A. Asplenium fontanum. B. Asplenium lanceolatum.

of sandstone, or some similar porous material. It is increased without difficulty by division. A magnificent mass of this plant, cultivated by Dr Young, can be scarcely less than a foot in diameter with fronds eight or ten inches long.

This plant is not much given to variation. Mr Wollaston notices a variety, *multifidum*, in which the fronds are occasionally bifid or multifid at the apex; this state is not uncommon, but it is also not permanent, and plants having this tendency sometimes produce a few of the pinnæ unusually large.

Mr Wollaston proposes for another supposed variety, of dubious origin, the name of *proliferum*. This interesting plant, which has been known to us since 1851, is so remarkably distinct, that were it not for the obscurity of its history, we should, without any hesitation, claim for it specific rank. Though most like *A. fontanum* of our British species, it is in fact quite unlike that plant in several of its characters. We do not recognise it in any published descriptions, nor can we find any specimens to which we can refer it in Sir W. J. Hooker's magnificent collection. The fronds we received in 1851 were from the gardens at Peper-Harrow Park, Surrey. It has since been exhibited at the metropolitan fêtes by Mr Parker, nurseryman, of Hornsey, who, we believe, holds the stock of it, and whose plants were obtained from Mr. Williams, gardener to C. B. Warner, Esq., of Hoddesdon. Mr Williams reports that about six years since he received it, as *A. viride*, from a gardener, whose friend had found it in Scotland, and sent three plants. This person, whose name was Filden, it appears died soon after the occurrence. Compared with *A. fontanum*, the fronds are longer and narrower in proportion, being seven or eight inches high, and not more than three-fourths of an inch wide. They have a dark brown rachis throughout, which is not distinctly winged, as in *fontanum*, although there is a slight green decurrent line at the upper angles between the pinnæ; the outline is different, being equal and almost linear, not broader upwards; the lower pinnæ are scarcely more distant than the rest, and they are all refracted in a remarkable manner, as well as much less divided; the habit of growth is spreading, and the fronds are proliferous. Mr Wollaston remarks, that "its having been associated with *A. viride*, and partaking so much of the aspect of that species as to have deceived some of our best pteridologists, is at least circumstantial evidence of its British origin. The little bulbils are formed principally at the junction of the pinnæ with the rachis." We are so convinced of its distinctness, that notwithstanding its dubious history, we shall add the accompanying definition, to furnish means for its recognition, and in the hope that the attention of botanists may be directed to its re-discovery.

A. refractum: fronds linear subbipinnate; pinnæ short oblong obtuse, refracted, pinnate at the base, pinnatifid above; pinnules (the lowest anterior one only distinct, the rest more or less confluent) roundish, with a few coarse angular mucronate teeth, the upper two-four toothed, the lower ones overlapping; sori short oblong oblique, in a line on each side near the costa of the pinnæ; rachis chestnut-coloured, marginate above, not winged, bulbil-bearing.

Hab. ? Scotland.

PLATE XXXV. B.

THE LANCEOLATE SPLEENWORT

(ASPLENIUM LANCEOLATUM).

ASPLENIUM, *Linnæus.*

Clusters of Spore-cases linear, oblong or elongate, straight, attached along the inner or anterior side of the veins or venules, furnished with an indusium or membranous cover. *Indusium* of the same form, entire or somewhat jagged on the margin, opening along the inward side, or that towards the midvein or axis of venation. *Veins* disunited at their extremities, their branches (*venules*) simple or forked, sometimes furcately branched without a midvein.

A. LANCEOLATUM; fronds lanceolate, rigid, glabrous, bipinnate; pinnæ ovate-lanceolate; pinnules obovate or obliquely ovate, blunt, lobed or toothed, the teeth coarse, angular, mucronate; rachis with slightly elevated margins in front, not winged, minutely scaly; sori short, oblong, produced towards the margin.

ASPLENIUM LANCEOLATUM, *Hudson, Flora Anglica* ii. 454. *Smith, English Flora* iv. 298. *English Botany* v. 240. *Deakin, Florigraphia Britannica*, iv. 67. *Hooker and Arnott, British Flora*, 579. *Babington, Manual of British Botany*, 414. *Newman, History of British Ferns*, 219 (excl. syn. Vahl and Salter). *Moore, Handbook of British Ferns*, 157. *Schkuhr, Farrn*, 47 [illegible] 27 [illegible]. *Willdenow Species Plantarum*, v. 346. *Sprengel, Systema Vegetabilium*, iv. 88 (excl. syn.). *Presl, Tentamen Pteridographiæ*, 108. *Fée, Genera Filicum*, 190.

ASPLENIUM ROTUNDATUM, *Kaulfuss, Flora*, 1830, i. 341. *Presl, Tentamen Pteridographiæ*, 108.

ASPLENIUM [illegible], *F. Schultz, Flora*, 1845, ii. 738 (Presl).

ASPLENIUM [illegible], *F. Schultz, Flora*, 1844, ii. 807 (Presl).

TARACHIA LANCEOLATA, *Presl, Epimeliæ Botanicæ* 82.

POLYPODIUM ASPLENOIDES, *Poiret, Encyclopédie Méthodique*, v. 540 (Presl).

EXPLANATION OF THE PLATE.

PLATE XXXV. B.—ASPLENIUM LANCEOLATUM, 1, from Jersey; *Dr. Allchin.* 2, from Guernsey; *G. Wolsey.*

HABITAT.—Though not entirely confined to the sea-coast, this plant must be regarded as a maritime and also a southern species. Its head quarters would seem to be the shores of the Bristol Channel, as it occurs from the Land's End throughout the peninsula formed by the counties of Cornwall and Devon, through Somerset to Gloucestershire on the one side, and in the counties of Glamorgan and Pembroke on the other; thence continuing along the shore of Cardigan Bay, appearing in the counties of Merioneth and Carnarvon, and perhaps Denbigh, one of its stations, near Llanrwst, being near the boundary of these counties. It again occurs in a more southward and inland station, at Tunbridge Wells. There are some doubtful records of its occurrence in Oxfordshire, Shropshire, and Yorkshire, the latter, according to Bolton's figure, certainly pertaining to *Asplenium adiantum-nigrum*. The true *Asplenium lanceolatum* has been recently found by Mr. W. Andrews, at Kinsale, Cork, [illegible] is thus added to the Flora of Ireland, and other [illegible] localities may be expected to reward a diligent search. [illegible] states that it [illegible] near Girvan [illegible] the west of Scotland, but though not unlikely, we do not find his statement confirmed. In the Channel Islands, as at Sark, Guernsey, and Jersey, it again occurs, and at least in the [illegible] most in profusion. Its favourite localities are the crevices of rocks and old walls, the sides of wells, and the shafts of deserted mines. Mr. N. B. Ward has favoured us with an account of a [illegible] which he found, along with others, almost closing the mouth of a well, [illegible]. The fronds of this plant were a foot or more in length, and the plant bore no fewer than one hundred and [illegible] perfectly fresh fronds, besides the remains of sixty or seventy others in various stages of decay. Mr. Ward found it most abundant on the western side of the island, varying much in situation and size, [illegible] fully exposed walls, scarcely more than a couple of inches high, [illegible] the densely shaded dry sandstone banks [illegible] damp [illegible] of wells, upwards of a foot in length. Mr. Ward [illegible] at an altitude of 600 feet in Wales, but Mr. Bennett reports finding it at an elevation of 700 feet, at Barmouth.

GEOGRAPHICAL RANGE.—*Asplenium lanceolatum* occurs in the islands of Madeira and the Azores (*Hb. Hooker, Lindley, Gower, Mus. Brit.*), and on the African coast at Tangiers (*Hb. Mus. Brit.*). In Europe it is found in Spain and Portugal (*Hb. Hooker, Lindley, Mus. Brit.*, *Mus. Paris*), in Switzerland (*Hb. Grev.*), and at Fontainebleau, and in Brittany, in the [illegible] west of France, which are the nearest [illegible] to the British shores. It [illegible] consequently an Atlantic species. A North American [illegible] Herbarium, [illegible] Mr. [illegible], very closely resembles this species.

Caudex short, thick, erect or decumbent, tufted, densely scaly. *Scales* elongately subulate, shining brown, cellulosely striate. *Fibres* stout, branched, tomentose.

Stipes shorter than the frond, usually about a third of the whole length, sometimes longer, dark chestnut-coloured below, which colour extends more or less along the back of the rachis; terminal

and adherent to the rhizome. *Rachis* flat in front, with a slight elevated margin, rounded behind, furnished sparingly with slender jointed hair-scales, *partial rachides*, winged, and also furnished with similar hairs.

Vernation circinate.

Fronds from three or four inches to a foot, or occasionally eighteen inches in length rigid, bright green, smooth except on rachides, lanceolate, bipinnate. *Pinnæ* broadest at the base narrowing to a point, usually horizontal, sometimes reflexed, scarcely more than half an inch in the smaller, two inches long in the larger fronds, all even the lowest scarcely stalked, sub-opposite or alternate, the lower more distant and somewhat shorter. *Pinnules* variable in form, obovate, obliquely-ovate, or dimidiately subquadrate, the anterior side being most developed, always more or less cuneate at the base. In the larger fronds they are pinnatifid below with obovate sharply-toothed lobes, and coarsely toothed above, the teeth being mucronate, in the smaller fronds the lobes are scarcely developed, the margin being coarsely mucronately-toothed. Occasionally the lower pinnæ are longer, sometimes the fronds are narrow and only pinnate with lobed pinnæ, and in other instances they are membranaceous.

Venation of the pinnules consisting of a flexuous midvein, alternately branched, the lowest anterior vein directed to the principal lobe, and developing as many venules as there are marginal teeth, one venule extending into each tooth, but not quite reaching the margin, the other veins are forked or simple, and correspond in number with the marginal teeth.

Fructification on the back of the frond and scattered over its whole surface. *Sori* indusiate, oblong, attached on the anterior side of the venules, that is, above the fork of the veins, occupying rather the centre of the lobes than the centre of the pinnules, which gives a sub-marginal appearance to the fructification, at first distinct, but becoming confluent in irregular masses on the lobes. Occasionally the sori are set back to back on the venule, and they are sometimes so abundant as to become in age confluent over nearly the whole frond. *Indusium* a white, oblong, slightly irregular membrane, wavy on the free or anterior margin. *Spore-cases* globose. *Spores* ovate, angular, roughish.

Duration. The rhizome is perennial. The fronds are persistent, and under shelter are produced at various times throughout the year, so that the plant is evergreen.

The affinity of this plant is with *Asplenium Adiantum-nigrum*, from which it may be known by its lanceolate, not deltoid, outline, by the presence of hair-scales on its principal and partial rachides, by the form of the sori, which is oblong, not linear, the sorus in *A. lanceolatum* being nearly represented in appearance by the upper half of that of *A. Adiantum-nigrum*, and further, by the position of the sori, which is here produced above, and in *A. Adiantum-nigrum* below the fork of the veins, consequently nearer the costa, so that in the latter the sori are central with respect to the pinnules, whilst in *A. lanceolatum* they are submarginal. The texture is thinner, and the pinnules more equable in size.

This is a very ornamental species, and with us potted in well drained soil of peat, loam, and sand, and subjected to the shelter of a shady frame or greenhouse, not kept excessively moist, it is one of the most manageable of the smaller evergreen species, always fresh and vigorous.

Of variations, hardly varieties, Mr Woolston enumerates three:—"1. *multifidum* (W.), a non permanent form, in which the apex of the frond is occasionally bifid or multifid. 2. *prolificum* (W.) an exceedingly scarce condition of the plant, having only been observed in two instances, namely, by Mr Baxter, of Oxford, and the Rev W. H. Hawker in both cases on cultivated plants. 3. *lacerratum* (W.), the peculiarity of which is, that the fronds are remarkably deciduous, the leafy portion being in some cases entirely wanting, and the fructification, which is generally very copious, protrudes on to the face of the frond, so that an inattentive observer would not distinguish the front from the back. The pinnæ and pinnules in this latter are frequently mere ribs or veins, it is sub-permanent, and not uncommon in the Channel Isles." Mr Jackson, of Guernsey, sends another from that island, in which the margins of the pinnules are so curled under as to give unusual prominence to the thickened teeth, it may be called (4) *crispatum*.

Plates XXXVI. XXXVII.

THE BLACK MAIDENHAIR SPLEENWORT

(Asplenium Adiantum-nigrum).

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ASPLENIUM, *Linnæus.*

Clusters of Spore-cases linear, oblong or elongate, straight, attached along the inner or anterior side of the veins or venules, furnished with an indusium or membranous cover. *Indusium* of the same form, entire or somewhat jagged on the margin, opening along the inward side, or that towards the midvein or axis of venation. *Veins* [illegible] at their extremities, their branches (*venules*) simple or forked; sometimes furcately branched without a midvein.

A. Adiantum-nigrum, fronds ovate or deltoid, acute or acuminate, glabrous, subcoriaceous, bi- tripinnate; pinnæ obliquely triangular, obtuse or acuminate; pinnules ovate or ovate-elongate-attenuate, pinnate or pinnatifid, the ultimate divisions oblong or subtrapezoid, cuneate at the base, shallowly lobed with the lobes toothed or simply toothed; teeth acute; sori linear-elongate, contiguous to the midvein.

Asplenium Adiantum-nigrum, *Linnæus, Species Plantarum*, 15[illegible]. *Bolton, Filices Britannicæ*, 30, t. 17, f. 1-3. *Smith, Linn. Tr. Botany* [illegible]. *English Flora*, [illegible]. *Gray, Flora Britannica*, [illegible]. *Hooker and Arnott, British Flora*, 573. *Mackay, Flora Hibernica*, 342. *Babington, Manual of British Botany*, [illegible]. *Moore, Handbook of British Ferns*, 155. *Newman, History of British Ferns*, 225. *Sowerby, Ferns*, [illegible]. *Schkuhr, Kryptogamische Gewächse*, [illegible]. *Willdenow, Species Plantarum*, [illegible]. *Sadler, Filices Hungariæ*, [illegible]. *Sprengel, Systema Vegetabilium*, [illegible] excl. syn. Willd. *Presl, Tentamen Pteridographiæ*, 107. *Fée, Genera Filicum*, 191.

Asplenium nigrum, *Bernhardi*.

Asplenium [illegible], *Lumnitzer, Flora Posoniensis*, no. [illegible] (Sadler).

Asplenium [illegible], *Salisbury, Prodromus*, 403.

Asplenium Onopteris, *Linnæus, Species Plantarum*, 1st ed. 1081.

Asplenium [illegible], *Vest, Flora [illegible]*. [illegible] *Presl*.

Asplenium argutum, *Kaulfuss, Enumeratio Filicum*, 7[illegible]. *Sprengel, Systema Vegetabilium*, [illegible]. *Presl, Tentamen Pteridographiæ*, 107.

Asplenium [illegible], *Schrader, Götting. Anzeig.* [illegible].

Asplenium [illegible], *Linnæus MS. in Herb.*

Tarachia Adiantum-nigrum, *Presl, Epimeliæ Botanicæ*, [illegible].

Var. **obtusum**, fronds ovate, smaller and less divided; pinnæ blunt or bluntish, not acuminate; pinnules [illegible] their rounded apices toothed; [illegible] winged.

Asplenium [illegible], *Kitaibel MS.* [illegible] *Willdenow, Species Plantarum*, [illegible]. *Sadler, Filices Hungariæ*, [illegible]. *Presl, Tentamen Pteridographiæ*, 107. *Fée, Genera Filicum*, 191.

Asplenium Adiantum-nigrum, var. [illegible], *Newman, History of British Ferns*, 2 ed. 258. *Moore, Handbook of British Ferns*, 155.

[illegible]

Asplenium [illegible], *Hoffmann, Deutschlands Flora*, [illegible].

[illegible]

[illegible]

Tarachia [illegible], *Presl, Epimeliæ Botanicæ*, [illegible].

Var. **acutum**, fronds deltoid, tripinnate throughout, and as well as the pinnæ, the lower ones especially caudate; ultimate pinnules narrow lanceolate, inciso-pinnatifid, the lobes linear, very acute, entire.

Asplenium acutum, *Bory MS.* [illegible] *Willdenow, Species Plantarum*, [illegible]. [illegible] *Newman, History of British Ferns*, [illegible]. *Sprengel, Systema Vegetabilium*, [illegible]. *Sadler, Filices Hungariæ*, [illegible]. *Presl, Tentamen Pteridographiæ*, [illegible]. *Fée, Genera Filicum*, 19[illegible].

[illegible] *Bory, Expédition Scientifique de Morée*, [illegible], 313.

Asplenium [illegible] *Newman, History of British Ferns*, [illegible]. *Moore, Handbook of British Ferns*, 155.

Asplenium [illegible] *Desvaux, Annales de la Société Linnéenne de Paris*, [illegible].

Asplenium [illegible] *Bory*, [illegible].

Asplenium [illegible], *Transactions Cambridge Philosophical Society*, [illegible] 321.

[illegible] *Presl, Epimeliæ Botanicæ*, [illegible].

EXPLANATION OF THE PLATES.

[illegible]

[illegible]

[illegible]

Caudex short, thick, tufted, often decumbent, scaly. *Scales* lanceolate below, extended into a long hair-like point, dark brown, shining, cellulosely striate below. *Fibres* stoutish, numerous, branched, [illegible]

Stipes elongated, usually about as long as, sometimes longer than, the leafy portion of the frond, dark purplish brown, bearing about the base a few scales like those of the crown, [illegible] flat and slightly grooved in front, rounded behind, terminal and adherent to the caudex. *Rachis* [illegible] from the presence of an elevated line on each margin decurrent from the stalk of the pinna, round, and with the brown colour of the base more or less extending upwards behind.

Vernation circinate.

Fronds [illegible] the stipes from [illegible] inches long [illegible] seven inches across the base of the leafy portion, usually coriaceous and shining dark green above, paler beneath, sometimes of thinner texture, deltoid, or ovate, or [illegible] below, always with a tapered or acuminated apex, bipinnate in the lesser forms, tripinnate or occasionally almost quadripinnate in the larger ones. *Pinnæ* obliquely triangular, usually elongate and attenuated at the apex, the lower nearly opposite, and always as long as, usually longer than the rest, the upper becoming alternate and gradually diminishing in size, all usually pointing upwards. *Pinnules* alternate, the lowest on the anterior side of the rachis, and considerably larger than the rest, obliquely and broadly ovate, with an attenuated apex, pinnate at its base, (the lowest secondary) pinnules being ovate obtuse, pinnatifid with sharply serrated lobes below and sharply serrated at the apex. Towards the apex of the pinnæ, which end in a more or less elongated acumen, the pinnules gradually become oblong and decurrent at the base, and the same occurs on a smaller scale in the larger lower pinnules themselves, the upper pinnæ again being [illegible] the pinnæ are less attenuated at the points, and the pinnules are shorter, blunter and either barely divided to the midvein or merely lobed. The ultimate divisions are all notched with distinct acute serratures

A. B. Asplenium Adiantum nigrum.
C. D. A. Adiantum-nigrum obtusum.

PRINTING.

Venation of the secondary basal pinnules in the tripinnate fronds, and of the primary basal pinnules in the bipinnate fronds, consisting of a flexuous midvein, which, by a series of furcations, sends out a vein towards each marginal tooth. If the pinnule is not deeply lobed, and the teeth are simple, these veins are also simple, and bear the sorus on their lower half commencing just above their base and extending half-way to the margin. If the pinnule is lobed below, one vein goes off to each lobe and divides into veinlets corresponding to the number of marginal teeth, one or two of these veinlets in the principal lobes bearing a sorus, the smaller lobes are occupied by one furcation of the vein: these veins, however, bear on their anterior side a long linear sorus, which commences near the midvein of the pinnule, and extends beyond the point of furcation. The veinlets extend within the serratures, but not quite to their apex.

Fructification throughout the back of the frond. *Sori* linear elongate, indusiate, on the anterior side and near the base of the veins, and therefore central with respect to the pinnæ: crowded, and soon becoming confluent. *Indusium* linear, entire, pallid, semi-transparent, and apparently violaceous from the dark colour of the spore-cases showing through it. *Spore-cases* globose, shining brown. *Spores* ovate, angular, roughish.

Duration. The caudex is perennial. The fronds are persistent through the winter, so that the plant is evergreen, and they are renewed annually late in spring.

From *A. lanceolatum*, which it most resembles, the Black Spleenwort may be known by its long stalked triangular fronds and elongated central sori, and almost always by its conspicuously stalked lower pinnæ; its surface is also of a more glossy texture.

It is a very ornamental species, and thrives moderately well under cultivation, if planted in a sandy soil, well supplied with drainage material, so that water does not stagnate about it. For outdoor rockwork moderately shaded it is exceedingly well adapted on account of its shining evergreen appearance; and if planted in porous soil among stones on a north aspect, it will generally flourish. It does not like a smoky confined situation, and is therefore less frequently seen in a thriving state in town gardens. It may be increased by division.

The Obtuse Black Spleenwort—A. ADIANTUM-NIGRUM OBTUSUM (PLATE XXXVI, C, D) should perhaps be considered rather as a less developed condition than as a variety, it being united by various gradations with the more developed plant, which we have taken as the representative of the species; nevertheless, its extreme states seem to claim especial notice. It is a comparatively small and dwarf plant, and assumes an ovate rather than a triangular outline. Some specimens are not more than two inches high, and others very marked in character are six or eight inches high. The smaller specimens are barely bipinnate, the pinnæ short and bluntly triangular, the pinnules roundish ovovate, and very indistinctly toothed. The larger examples are tripinnate, with their primary and secondary pinnules corresponding with the pinnæ and pinnules of the small specimens. It is probably not uncommon, specimens from the three kingdoms being before us.

The Acute Spleenwort—A ADIANTUM-NIGRUM ACUTUM—(PLATE XXXVII) is a more distinct plant and might perhaps be separated from *A. Adiantum-nigrum* without much inconvenience or error. There are, however, connecting links, which, in a botanical point of view, seem to indicate too close an affinity to favour the separation of the two, and suggest rather the idea that the one is the extreme development of the other. The texture of the plant is firmer and less cornaceous than the usual states of *A. Adiantum nigrum*, but some forms of the latter are undistinguishable in this respect. The caudex is short, thick, and tufted, like that of *A. Adiantum-nigrum*, with which it also agrees in being furnished at the crown and on the base of the stipes with cellulosely reticulated scales, lanceolate below and ending in a hair-like point, as well as having elongated dark purplish brown stipes. The fronds in the Irish specimens vary from about six to eighteen inches in length including the stipes, and are from about two and a half to seven or eight inches across the base of the leafy portion, it

a very fine example before us, the leafy part is eight inches long and seven broad, the stipes nine inches long. They are quite smooth, and in outline are sometimes deltoid, or perhaps more correctly pentangular the apices of the lowest posterior pinnules forming additional angles, sometimes ovate with the point much attenuated. Full-sized examples of the latter, and a rather small frond of the former state, are shown in our Plate. The smaller might be supposed to indicate a less mature condition of the plant, but we are scarcely prepared to adopt this explanation, on account of the occurrence of equally small fronds in which the pentangular outline is preserved, while again the ovate fronds are often abundantly fertile; and we would rather suggest that it is an instance of that profusion of form in Nature which mocks at our specific definitions. In the larger fronds, which are almost quadripinnate, the pinnæ, especially the lowest which is also the largest, are of the same subdeltoid outline as the frond itself except in that as the pinnules are alternate and not opposite as the lower pair of pinnæ are, there is a degree of obliquity almost producing a trapeziform outline. The apices of the pinnæ as well as of the fronds and generally of the pinnules, are caudate, with a few [illegible]. The larger pinnules of the lowest pinnæ are somewhat obliquely ovate-attenuate and their divisions the secondary pinnules, are lanceolate, deeply pinnatifid at a very acute angle, the lobes, the lower of which are about three-toothed, the upper bifid at their points, these lobes as well as the simple teeth at the apex of the pinnule itself being narrow and very acute. The pinnæ towards the apex of the frond, and the pinnules towards the apices of the pinnæ, become gradually narrower than the basal ones described above, until they both become reduced to linear lanceolate sharply toothed lobes, and these gradually merge into the simple linear teeth of the caudate extremities. A similar mode of division but on a smaller scale, obtains in the smaller forms. The frond is being only tripinnate, and the secondary pinnæ as narrower, and less deeply lobed. The veins, though slender, are very distinct, they consist of a series of furcations, that is to say the vein which represents the true vein of the pinnules forks below each of the lobes or teeth, and the vein so thus produced proceeds along the tooth or lobe until it nearly reaches the apex, going in the case of the former simple and in the case of the latter again forked once or twice, according as there may be two or three apical teeth. No one who has observed the venation in this plant, and is acquainted with our British *Asplenieæ*, can fail to notice the similarity in form and division and in the condition of the veins that exists between some of the pinnules of this plant, especially the shorter and broader ones of the less divided fronds, and some fronds of *A. septentrionale*. There is no definite midvein, but a series of furcations only, so that this plant alone furnishes sufficient evidence against the adoption of Mr Newman's group *Amesium* as a genus. The sori are very narrow, linear, borne, as in *A. Adiantum nigrum*, contiguous to each other, and near the centre of the pinnules. The indusium is white, semi-[illegible] spreading and entire. The plant is one of unusual elegance, both on account of its minute subdivision and its [illegible] shining surface.

Some other varieties of this species deserving of record, are included in the following summary:

1. *obtusum* (Wallr.). This form, already described, is rarely more than bipinnate, though sometimes tripinnate, with roundish or bluntly ovate pinnules, not very conspicuously toothed. It is less defined than some other forms, some of the smaller states of the common plant approaching it very closely, but as it occurs under different phases, it seems to claim recognition at least as a variety of secondary importance. A tripinnate example of this form has been communicated by Mr D. Moore, from the county Antrim, Ireland.

2. *oblongum* (M.). The chief peculiarity of this form is the parallelism of the sides of its fronds which thus become narrow oblong like what occurs in *Lastrea spinulosa*, the pinnæ are short remarkably triangular, acuminate, the three lower pairs almost equal in size. The subdivisions are small otherwise the structure is normal. We have received it from Mr Jackson, of Guernsey and it has also been found by Dr Allen.

RINTING.

Asplenium Adiantum nigrum acutum

3. *variegatum* (W.). This exceedingly rare and beautiful variety has been found in Yorkshire, and also in Guernsey by Mr Jackson. It is normal in every respect, except in being striped unsymmetrically with white, and is sub-permanent, depending for its variegation, as Mr Wollaston observes, on the mode of culture adopted. It is quite different from the usual so-called variegations of this species. Such are for the most part certainly caused by insect attacks, although one example, found by Mr Silver on Shottisbrook Church in Berkshire, has the appearance of actual variegation, being distinctly margined with yellowish-white. As it does not appear, however, to have again been met with, we only mention it thus incidentally in this enumeration.

4. *multifidum* (W.). This differs in having the apex of the frond, and very rarely of the pinnæ, bifurcate or multifid.

5. *fissum* (M.). A curious form with a caudate frond, the pinnules being rather abnormal-looking, and irregularly cut into long linear acute entire segments or lobes, answering to the acute teeth of the usual states of the plant, some of the pinnules may be said to be palmately-laciniate. We have received it recently from Miss Hoseason, who gathered it near Kingsbridge, in South Devon, and, some time since, from the late Mr Ingpen, who obtained a plant of it from a London hawker.

6. *intermedium* (M.). Under this name are included those forms in which large size and laxity of habit are coincident with an elongation of the parts, and a thin though firm texture of the fronds, such forms having often been wrongly associated with *acutum*. From that variety they differ in their more elongated and less compound fronds, and in the greater breadth of their ultimate divisions. The pinnæ and the fronds are caudate, but there are no linear segments of the pinnules. It seems to bear about the same degree of relation to the normal state as *obtusum*, but in an opposite direction, and we enumerate it as a variety merely in order to point out the steps by which the more usual state of the plant approaches the distinct-looking acute form. We have received it principally from the West of England and the Channel Isles.

7. *oxyphyllum* (M.). This form in its texture and the acuteness of its divisions has a good deal of resemblance to the true *acutum*, but it recedes from it even more than the last in the outline of the frond, which though small is rather narrow and elongated, with a tendency to diminution rather than enlargement of the lower pinnæ. The pinnæ are short, very oblique from the enlargement of the basal anterior pinnule, the latter being more distinct and distant than the remainder, which become a good deal confluent, the teeth are deep, narrow, and conspicuously acute. Some plants were found in 1855, near Duncon, in Argyleshire, by Mrs. East, of Blackheath.

8. *decompositum* (M.). This, like *acutum*, is almost or even quite quadripinnate, and may be briefly described as resembling that variety in the form of its fronds and pinnæ, and even pinnules, but the ultimate parts though narrow are blunt as if rounded off, not acute as in that, and the texture is more coriaceous. The divisions, moreover, although small and comparatively narrow, are not so much narrowed as in *acutum*, and the absence of linear segments, and the bluntness of the few teeth which are apparent, readily distinguish this plant from that. We have received it from the Rev. J. M. Chanter, who found it at Manaton, in Devonshire.

9. *acutum* (Bory). This, which has been already fully described, differs in its more subdivided fronds, in which the deltoid mode of growth is usually strongly developed, in its thinner and papery texture, and in the presence throughout of linear acute segments and teeth. As to its distinctness, the preceding enumeration of varieties or forms occurring in this country shows that in composition it is simulated by *decompositum* in texture by *oxyphyllum* especially, and by *intermedium* in a considerable degree, and in the presence of linear segments or teeth both by *oxyphyllum*, in which the teeth though sharp are short, and by *fissum*, in which latter the narrow marginal divisions are, perhaps, rather abnormal developments of the teeth, than normally narrow divisions of the pinnules. These points of resemblance, however, and the occurrence of other forms intermediate states, have determined us in retaining *acutum* as a variety of *A. Adiantum-nigrum*.

PLATE XXXVIII

THE SEA SPLEENWORT (ASPLENIUM MARINUM).

ASPLENIUM, *Linnæus.*

Clusters of Spore-cases linear, oblong or elongate, straight, attached along the inner or anterior side of the veins or venules, furnished with an indusium or membranous cover. *Indusium* of the same form, entire or somewhat jagged on the margin, opening along the inward side, or that towards the midvein or axis of venation. *Veins* disunited at their extremities, their branches (*venules*) simple or forked, sometimes furcately branched without a midvein.

A. MARINUM, fronds linear or linear-lanceolate, tapered above, pinnate, pinnæ ovate oblong or linear, oblique, shortly stalked, the margin serrate unequally crenate or lobate, rarely pinnatifid, the anterior base truncate and sub-auriculate, the posterior cuneate, upper ones confluent, sori large, elongate, borne near the midrib, rachis and petiole winged.

ASPLENIUM MARINUM, *Linnæus, Species Plantarum*, 1540. *Bolton, Filices Britannicæ* 26 t. 15. *Smith, English Botany*, vi., t. 392, *English Flora*, iv. 294. *Hooker, Flora Londinensis*, iv., 57, t. 60. *Deakin, Florigraphia Britannica*, v. 69. *Hooker and Arnott, British Flora*, 573. *Mackay, Flora Hibernica*, 311. *Babington, Manual of British Botany*, 414. *Moore, Handbook of British Ferns*, 159. *Newman, History of British Ferns*, 235. *Sowerby, Ferns*, 50, t. 29. *Schkuhr, Kryptogamische Gewächse*, 64, t. 68. *Willdenow, Species Plantarum*, v. 318. *Sprengel, Systema Vegetabilium*, iv. 83. *Presl, Tentamen Pteridographiæ*, 107. *Pir. Genera Filicum*, 190.

ADIANTUM TRAPEZIFORME, *Hudson, Flora Anglica*, ii. 400, according to Smith, Bolton, and nearly all authors but Hudson describes his plant as "supradecompound."

Var. **MICRODON**, fronds membranaceous, pinnate, the lower pinnæ distinct obtuse obliquely triangular, or sub-hastate, undulate and lobate below, the lobes and the apices of the pinnæ minutely apiculate-dentate, sori small, narrow, remote from the midrib.

ASPLENIUM MICRODON, *T. M. MS., in Herb.*

Var. **SUB-BIPINNATUM**, fronds pinnate, the pinnæ almost again pinnate at their base and deeply pinnatifid throughout, anterior basal lobes oval acute serrate.

EXPLANATION OF THE PLATE.

PLATE XXXVIII. ASPLENIUM MARINUM; **A**, from Jersey; *Dr. Allchin.* **B**, from Guernsey, *G. Wolsey.* **C**, from Cornwall, *J. Atkins.* **D**, from St. Bride's Bay, Jersey, *S. O. Gray.* **E**, from Exeter, Devon; *R. J. Gray.* **F**, from Totnes, Devon, *O. Scott.* **G**, A. MARINUM CRENATUM, from Hulme Quarry, Warrington; cultivated, *T. G. Rylands.* **H**, A. MARINUM RAMOSUM, from Ireland; cultivated, *Dr. Young.*

HABITAT.—This plant occurs, and often abundantly, on all our coasts, with the exception of those of the eastern side of England. It is most profuse in the south-west of England and in Wales, thence spreading but diminishing in frequency, eastwards as far as Sussex, and northwards to Orkney, from which latter point it passes, occurring here and there, along the eastern side of Scotland to Yorkshire. It is found also in the Hebrides, and is abundant on the Irish coasts, and in the Channel Islands. From one of the latter, Guernsey, we have received specimens gathered by M. Boistel, measuring thirty-four inches in length, of which twenty-four inches were occupied by about thirty pairs of pinnæ, the largest of these being about two inches and a half long, and three-eighths of an inch wide; larger specimens were produced on the same plant, which was growing without soil on a damp rock! It is a maritime plant, but it occurs in some few cases inland, as at Newton, near the neighbourhood of Warrington, in Lancashire, whence Mr. T. G. Rylands has sent one of the fronds we have figured; again, on the side of Turk Mountain, Killarney, as recorded by Mr. Newman. It probably does not attain any considerable altitude above the [illegible].

GEOGRAPHICAL DISTRIBUTION.—The species seems limited in Europe to the western part, whence it crosses from Spain to Tangiers, on the African coast, and is again found in Madeira, the Azores, and the Canaries. More southward, it appears in St. Helena (*Hb. Hooker*). Sir W. Hooker's Herbarium also contains specimens marked as having been brought from New Holland, together with others of small size from New Brunswick and similar ones from North America, not specially localised.

Caudex tufted, erect, or decumbent, densely scaly. *Scales* dark brown, shining, cellulosely striate, lanceolate, extended into a long hair-like point. *Fibres* branching, numerous.

Stipes shorter than the frond, smooth, channelled in front, chestnut-coloured or purplish-brown,

terminal and adherent to the caudex. *Rachis* margined and more or less coloured brown below, winged [illegible]

Vernation circinate.

Fronds including the stipes averaging from six to twelve inches long, sometimes shorter, occasionally upwards of a yard long, smooth, coriaceous, broadly linear tapering to the apex, pinnate. *Pinna* [illegible] between oblong, oblong-ovate, and linear, obtuse, often of nearly equal width throughout, usually about an inch in length, the anterior base truncately rounded, and produced into a blunt more or less apparent auricle, the inferior base cut away obliquely. The lowest are stalked with the stalks winged, the upper become decurrent, and at length confluent into a tapering pinnatifid apex. The margins are usually doubly crenate serrate, the serratures unequal, sometimes deeper, forming evident lobes, sometimes (as in fig. 6.) the incisions form very even and elegant crenatures.

Venation consisting of a prominent flexuous midvein from which proceed forked *veins*, the lowest anterior veins [illegible] three times forked, the rest usually once only, the *venules* terminate abruptly within the margin, the anterior ones generally bearing the sori.

Fructification spread over the back of the fronds. Sori linear, oblique, indusiate, borne on the anterior side of the venules (except sometimes on those of the auricle, when two or more sori are borne by the same fascicle of veins), commencing near the midvein, and forming two series of short divergent lines along each pinna. The sori, though consisting of a profusion of spore-cases, are commonly distinct, though they sometimes coalesce so as to cover the whole under surface. *Indusium* of the same form, persistent, entire. *Spore-cases* numerous, globose, brown. *Spores* ovate, angular.

Duration. The caudex is perennial. The fronds being persistent, and the young ones each year produced long before the old ones decay, the species is truly evergreen.

This is a well marked species, distinguished technically from the other simply pinnate British Aspleniums by its winged rachis, and generally by its greater size and more coriaceous texture, this latter feature giving to it an aspect of massiveness as compared with its size, by which it may be known at first sight.

This species is easily cultivated in sheltered situations, as in a frame or greenhouse, and thrives remarkably in a moist stove. It does not bear frost or exposure, and we have found it to be destroyed by being frozen, even when kept in a close greenhouse. Few of the smaller Ferns are more ornamental, or more deserving of cultivation than the Sea Spleenwort. Its fronds, owing to their thick leathery substance, are long enduring, and they are moreover of a deep shining green, and thus, with very little care, may be kept clean and bright,—a state which tends greatly to the preservation of the health of a cultivated plant, and a ways adds immeasurably to its beauty and to the attention and interest which it excites. Hence for a shady greenhouse, no Fern can be more appropriately chosen, while, even for very sheltered situations out-doors, especially in localities near the sea, the same qualities recommend it.

We may take this opportunity to state generally the kind of treatment which has been found to suit the small evergreen Ferns of this character when under pot culture. The pots in which they are planted should be of moderate size compared with the plant, that is, their diameter exceeding by two or three inches only, the breadth of the crown or mass formed by the caudex. They grow well either in a soil of turfy peat and silver sand, with a small proportion of friable yellow loam, and liberally intermixed with small nodules or fragments of sandstone or porous brick, or in a mixture of which sandy fibrous loam forms the staple, and in which the coarser materials are also blended. In either case, the bottom of the pots must have a good layer of these latter materials for drainage. The crown should be kept rather above the surface of the soil, and is perhaps best set between two or three larger somewhat

Asplenium marinum.

'RE PRINTING.

raised pieces of stone or brick. The soil, which should be used when neither wet nor dry should be made firm, being then less subject to alternations of moisture. Unless the pots become filled with roots, so that more nourishment is required by the plants—and this is generally evinced by the plants drying rapidly compared with others not so circumstanced—the less the soil or the plant is disturbed the better, so long as the former continues in a free healthy state. If it becomes saturated with water, as sometimes happens from the drainage becoming choked, from careless watering, or from the plants standing under a drip, then the plants should be repotted, so as to rectify the evil. No Ferns, on the other hand, like to be kept dry at the root, but they should have such supplies of water as will keep the soil just moistened thoroughly. A moderately damp and rather shady situation is most congenial to the growth of the fronds, no situation being more suitable for the progress of the plants than a cold close shady frame or pit, from which frost is just excluded. The plants increase with tolerable facility by division. When obtained from their wild localities, the roots are often much damaged in detaching the plants from the rocks to which they cling, and in such cases they require some care to get them established. It is better in cases of this kind to choose small compact plants in preference to larger ones. Once established, they grow readily, and may then be increased by dividing the crowns at the time of repotting, which is best done in spring.

There are some very curious variations of this plant now known, for the most part, however there is no evidence of their constancy.

1. *aculum* (M.). Instead of the usual obtuse or at most bluntly tapering apex of the pinnæ, it is in this gradually narrowed to a point, the pinnæ being also generally elongated. This form occurs chiefly in the west of England and in the Channel Islands.

2. *dichotomum* (W.). An inconstant variation, in which the apex of the frond is forked.

3. *ramosum* (W.). The chief peculiarity in this variety is that the fronds are branched, or more frequently paired. The pinnæ are undulato-crenate, slightly lobate, with blunt teeth. The venules appear more clavate than usual. It is a rare form, and was found in 1850 by Mr Wollaston, in Dorsetshire, since that time it has retained its character. A similar plant has been sent to us from Totnes.

4. *trapeziforme* (Clapham). The fronds of this variety are robust and leathery, the pinnæ nearly trapeziform, imbricate, and crenulate. It was found by Mr Clapham, at Scarborough, Yorkshire, and is a permanent form.

5. *crenatum* (M.). This is remarkable for its short, obtuse, oblique, trapeziform pinnæ, evenly notched round the margin with small but deep roundish crenatures. It occurs in a stone quarry, near Warrington, and has been communicated by Mr T. G. Rylands.

6. *cuneatum* (M.). This is peculiar from the absence of the auriculiform projection usual at the anterior base, the base of the pinnæ being truly wedge-shaped, the pinnæ are oblong, with deep sharp uneven serratures. It was found by Dr. Allman at Black Head, Clare, Ireland.

7. *macrodon* (M.). This is the most remarkable variety with which we are acquainted, and but for a repugnance to add to the number of dubious species, we should be tempted to consider it distinct. Its chief points of discrepancy are its sub-membranaceous texture, its undulately-lobed pinnæ, its denticulated margin and small patent apiculated teeth, and its small dispersed sori, which in their disposition follow rather the margin than the midrib, and in their shortness and paucity of spore-cases bear no comparison with those of any British Asplenium at all resembling the present plant. It resembles *A. marinum* in its scaly crown, pinnate fronds, and winged rachis. It is not so much divided as *A. lanceolatum*, or *A. obovatum*, from which also it differs in other respects. We are inclined to think it will prove really distinct when better known. It is a native of Guernsey and has been found during the past year (1855) first by Miss Wilkinson, and subsequently in other stations by Miss Mansel, of the Quesne, and Mr C. Jackson, to the latter of whom we are indebted for specimens, and for our knowledge of the plant. Mr Jackson informs us that it grows on

banks of rough masonry without mortar, and intermixed with *A. lanceolatum*, at some distance from the sea

8. *assimile* (M.). This form has the acute elongated pinnæ of *acutum*, with somewhat the lobing of *sub-bipinnatum*, or else is narrow and strongly auriculate, the pinnæ resembling those of the Australian *A. caudatum*, or the West Indian *A. auritum*. It occurs in two or three forms in Sir W. Hooker's collection the most strongly marked, resembling *caudatum*, being from Galway

9. *sub-bipinnatum* (M.). The most divided form we have seen. The fronds are of moderate size, but the pinnæ, which stand more distant from the rachis than usual, are deeply pinnatifid throughout, and the basal anterior lobes, which are the largest, are almost separate, nearly a narrow oval in outline, simply or doubly serrate on the margin. It was found in a cave at Petit Bot Bay, Guernsey, by Mrs. Dobree, of the Forest, Guernsey

PLATE XXXIX.

THE COMMON MAIDENHAIR SPLEENWORT

(ASPLENIUM TRICHOMANES).

ASPLENIUM, *Linnæus.*

Clusters of Spore-cases linear, oblong or elongate, straight, attached along the upper or anterior side of the veins or veinlets, furnished with a [illegible] or membranous cover. *Indusium* of the same form, entire or somewhat jagged on the margin, opening along the inward side, that towards the [illegible] or axis of venation. *Veins* [illegible] at their extremities, their [illegible] (*venules*) simple or forked, sometimes furcately branched without [illegible].

A. TRICHOMANES: fronds linear, pinnate; pinnæ roundish-oblong, roundish ovate or obovate, scarcely stalked, obliquely cuneate at the base, crenated; rachis chestnut-coloured throughout, margined in front with a [illegible]-coloured erect narrow membranaceous border [illegible] herbaceous wing, [illegible] distinct from the midrib.

ASPLENIUM TRICHOMANES, *Linnæus, Species Plantarum*, 1540. *Bolton, Filices Britannicæ*, [illegible]. *Smith, English Botany*, [illegible] 576. *English Flora*, iv. 302. *Hooker, Flora [illegible]*, [illegible]. *Babington, Manual of British Botany*, [illegible]. *Hooker and Arnott, British Flora*, 583. *Newman, History of British Ferns*, [illegible]. *Moore, Ferns [illegible]*, [illegible]. *[illegible] Filicum Britannicum*, iv. 73. *Moore, Handbook of British Ferns*, 162. *Sowerby, Ferns*, [illegible]. *Schkuhr, Kryptogamische Gewächse*, [illegible]. *Willdenow, Species Plantarum*, v. 331. *Sprengel, Systema Vegetabilium*, iv. [illegible]. *Presl, Tentamen Pteridographiæ*, 105. *[illegible], Genera Filicum*, [illegible]. *A. Gray, Botany of the Northern United States*, [illegible].

ASPLENIUM TRICHOMANOIDES, *Weber and Mohr, Deutschlands Kryptogamische Gewächse*, [illegible]. *Withering, Botanical Arrangement of Vegetables*, 653. *Lightfoot, Flora Scotica*, [illegible].

ASPLENIUM [illegible], *Willdenow, [illegible]*, [illegible]. *Species Plantarum*, v. 332. *Sprengel, Systema Vegetabilium*, iv. [illegible]. *Presl, Tentamen Pteridographiæ*, [illegible]. *[illegible], Genera Filicum*, [illegible].

ASPLENIUM SAXATILE, *Salisbury, Prodromus*, 403. *[illegible], Natural Arrangement of British Plants*, ii. [illegible].

TRICHOMANES [illegible], *[illegible], [illegible]*, [illegible].

Var. INCISUM: pinnæ deeply pinnatifid, the segments narrow, inciso-serrate, barren.

ASPLENIUM SAXATILE [illegible], *Gray, Natural Arrangement of British Plants*, [illegible].

ASPLENIUM TRICHOMANES *β*, *Smith, English Flora*, v. 282. *Moore, Handbook of British Ferns*, [illegible].

EXPLANATION OF THE PLATE.

PLATE XXXIX. ASPLENIUM TRICHOMANES. **A**, fronds, [illegible], *S. F. Gray*. **B**, from [illegible], Devon, *C. Scott*. **C**, A. TRICHOMANES [illegible], from [illegible], *Dr. Allchin*. **D**, A. TRICHOMANES [illegible], *F. Bateson*. **E**, The same, from Borrowdale, Cumberland, *Miss Wright*. **F**, A. TRICHOMANES [illegible], from Keswick, *Miss Wright*. **G**, A. TRICHOMANES [illegible], from St. Mary's Isle, Kirkcudbright, cultivated, *Edinburgh Botanic Garden*. **H**, A. TRICHOMANES CRISTATUM, [illegible], *Dr. Allchin*.

HABITAT.—This species is generally distributed throughout the United Kingdom and Ireland, growing on walls, rocks, and stones, more rarely on hedgerow banks, where, however, it attains greater luxuriance. It is found at an elevation of upwards of 2000 feet above the sea. Specimens from the west of Ireland, communicated by Mr. W. Andrews, and from [illegible] by Mr. R. Barrington, are upwards of a foot in length, and furnished with above thirty pairs of pinnæ of about half an inch long and a quarter inch broad.

GEOGRAPHICAL DISTRIBUTION.—Throughout Europe, extending eastwards to Greece, and westwards to the Spanish peninsula, [illegible] Madeira and the neighbouring Atlantic [illegible] to the Cape of Good Hope (*Herb. Hooker*). In Asia it is found in the region of the Caucasus, in Persia, [illegible] parts of India, Afghanistan, Kashmir (a form with strongly crenated pinnæ), Bootan, Sikkim, [illegible] Siberia, in the [illegible] Altai ranges, and in the region of Lake Baikal. Some of the Sikkim and Persian specimens resemble [illegible], and the Altai [illegible] marked variety, having the lower pinnæ nearly triangular, the upper narrow oblong, and the intermediate [illegible] (*Herb. Hooker*). The species is met with in Van Diemen's Land, and at Sydney, Bathurst, Victoria, and [illegible], in Australia. In America it occurs in various parts of the United States, from Vermont to New Mexico (*Herb. Hooker*), in British America, from Montreal to [illegible], [illegible] (*Herb. Hooker*). It is again found in the Sandwich Islands (*Dr. Lindley* and *Hooker*). The [illegible], which occurs in the Canaries, Madeira, and the adjacent islands, and [illegible] a marked [illegible] of *A. Trichomanes*, [illegible] its narrower and more elongate, [illegible] pinnæ and [illegible] stipes, has not, we believe, been found in Britain. The [illegible] and [illegible], appear to be very nearly related to *A. Trichomanes*.

THE COMMON MAIDENHAIR SPLEENWORT

Caudex short, tufted, scaly, erect or decumbent. *Scales* lanceolate, brown, cellular, often with a dark central stripe. *Fibres* wiry, branching.

Stipes short, smooth, chestnut-coloured or dark brown, rounded behind, flat in front, with a raised line on each face at each angle, terminal and adherent to the rhizome. *Rachis* also chestnut-coloured throughout, projecting but rounded behind, flat in front, and furnished with a narrow elevated wing-like border.

Vernation circinate.

Fronds two or three inches to twelve or fourteen inches long, linear, pinnate. *Pinnæ* herbaceous, deep green, variable in shape, but for the most part roundish oblong, obtuse at the apex and obliquely cuneate at the base, scarcely stalked, but attached to the rachis by the lower angle, usually crenated but sometimes nearly entire on the margin, and always entire on the cuneate base. Sometimes most of the pinnæ, and usually the lower ones, are more ovate in outline and less unequal-sided, more rarely the reduction of the upper basal angle gives the pinnæ an obovate outline. The pinnæ are readily detached from the mature fronds, and eventually fall away, leaving the rachis bare.

Venation consisting of a midvein, from which issue forked veins, terminating within the margin, the anterior of the *venules* or branches bears the sorus above the point of furcation.

Fructification generally distributed over the frond. *Sori* linear, oblique, numerous, often becoming confluent, immature. *Indusium* entire or slightly crenated on the free margin. *Spore-cases* numerous, globose. *Spores* angular, rough.

Duration. The caudex is perennial. The fronds are persistent, so that the plant is evergreen, a crop of young fronds appear in the spring.

This species has much resemblance to *A. viride*, but may be known by its dark brown rachis, and the thin raised border of the latter, and further by the attachment of the pinnæ, almost stalkless in this, and distinctly stalked in *A. viride*. It does not resemble any other native species.

It grows with tolerable facility under culture, but still is very apt to suffer if kept too damp under confinement. Pure and porous soil containing a considerable proportion of hard material, such as sand or broken sandstone, bricks, or old mortar, should be used, and excess of moisture must be avoided. In country rockeries it succeeds when such precautions are taken, but in town gardens it requires shelter, and then even more care is necessary to guard against excess of moisture.

In endeavouring to account for the difficulties which occur in cultivating Ferns such as the present, which sometimes prove to be rather shy growers under artificial treatment, the natural conditions under which the plant occurs should be well studied. Here is a species abundant enough naturally which oftentimes refuses to maintain its natural vigour under cultivation, and why? In most cases it will be found that there is something wrong at the foundation, the roots are suffering. Indeed, this appears to be the principal source of failure in cultivating the Common Maidenhair Spleenwort. The plant naturally grows on the perpendicular face of walls or rocks, inserting its roots into the crevices and fissures where it finds enough nourishment, or even when growing on banks the soil is generally of an open sandy texture, so that water does not stagnate. It should not, therefore, be planted in large masses of soil retentive of moisture, the crown should be elevated between fragments of stone, the pots should have an extra amount of drainage, and finally, sand, fine broken brick, broken sandstone, or the rubbly portions of mortar from old buildings, should be freely used. In short, above that portion which is kept free for drainage, the pot should be filled up with coarse pieces of brick, rock, or mortar, and the interstices only filled with finer soil, in which the same ingredients, mixed with sandy loam, should predominate. This mode of potting is suitable especially for the present species, the Wall Rue, and the Ceterach. None of these plants, moreover, require so much shade as other Ferns, although if they are kept tolerably dry at the crown they do not refuse to grow in structures

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Asplenium Trichomanes.

which are shaded for others. Water must be applied cautiously, the crowns or centres of growth should not be wetted, and the fronds themselves are the better for being kept dry, although an occasional syringing, if necessary to cleanse them, will not be found injurious, provided they are afterwards allowed to dry. The more successful instances we have seen of the cultivation of this Fern were in cases in which the atmosphere of the greenhouse was kept rather drier than is usual in Fern houses, and this is just what the natural habit of the plant would lead one to expect.

Since writing the above, Mr Wollaston, who is a very successful grower of Ferns, has favoured us with the following memoranda of his experience with this species. He says it succeeds best with him planted in sandy loam, with a *very slight* admixture of perfectly decayed leaf-mould, over plenty of drainage, without moss above it, with a free use of water, and free ventilation. "Finding it difficult to manage," he writes, "I tested it in the following way. I took six seedlings of *A. Trichomanes cristatum* of the same age, and as nearly as possible of the same size, and planted them in pots of the same size, but all in different admixtures of soil, giving them otherwise the same treatment. That planted in sandy loam did best, very perceptibly, and that in sandy peat did worst, that in pure leaf-mould was bad also."

Until lately very little variation had been observed in this species, now however, several marked varieties are known, and they, for the most part, seem to have the quality of constancy.

1. *dichotomum* (W.). This resembles the normal form in every respect except the dichotomous division of the apex of the frond. It is occasionally met with, but is not constant.

2. *bifurcum* (W.), is a neat and pretty variety, differing in having the apical lobe frequently enlarged and always doubly or trebly furcate. It is rare, and constant under culture. It was found near Maidstone, in Kent.

3. *ramosum* (W.). This is very much ramified, and is a highly developed form of *dichotomum*. It is so nearly constant under cultivation as to claim a place among the permanent varieties. The apical lobes, as in *bifurcum*, are frequently enlarged and bifid or multifid, and the rachis is two or three times forked. When there are many divisions of the rachis, the pinnæ are often irregular and depauperated, and they are often strongly crenate. It was found in Devonshire by Potter a well known dealer, since dead, again by Dr. Kinahan on Quin Abbey, Clare, Ireland, and by Mr F. Clowes, near Windermere, Westmoreland. A very beautiful form, analogous to these, but branching lower down the rachis, has been sent from the neighbourhood of Keswick by Miss Wright, and we have received other fine examples from Ilfracombe, gathered by the Rev. J. M. Chanter.

4. *multifidum* (M.). This is ramosely bi- or tri-dichotomous in the rachis towards the apex of the frond as in the last, but differs in having the apices all multifid crisped. It is a free-growing handsome form, and constant, being reproduced from the spores. It was found by Mr Dick at St. Mary's Isle, Kirkcudbright, and has been communicated by Mr J. McNab from the Edinburgh Botanic Garden.

5. *cristatum* (W.). This very graceful and uncommon form has the apex of the frond beautifully tufted or tasselled, but it very seldom ramifies in the lower part of the stipes. It has a free and vigorous habit of growth, and is invariably reproduced from the spores, and constant under cultivation. Its early history is lost, but some seedling plants made their appearance in a mass of *Hymenophyllum unilaterale* sent to Mrs. Deives, of Tunbridge Wells, Kent, from the Glasgow Botanic Garden.

6. *depauperatum* (W.). This peculiar form was found in 1853, by Dr Allcain, in Clare, in Ireland, and again in 1855, by Mr Wollaston, at Rydal, in Westmoreland. The pinnæ are very narrow, serrate or laciniate, and towards the apex of the frond so depauperated that the spore-cases protrude and appear to come from the face of the frond, giving the plant a very curious appearance. The apex is sometimes a mere winged rib. It is very rare. Other forms approaching this, but less or scarcely at all depauperated, and having the pinnæ distinctly crenated, were found at the same place by Dr Allcain.

7. *subæquale* (M.). These resemble the crenated forms just mentioned, but are more equal in the

pinnæ, which are attached near their centre, instead of by the lower angle, the pinnæ are oblong and elegantly crenated. It has been sent to us from the banks of the Wye, near Monmouth, by Mr J. D. Enys.

S. dentatum (M.). A large form, remarkable for having the pinnæ, especially those about the middle of the frond, deeply divided at the base into two or more broad obovate lobes, in some instances separated almost to the midrib. It was found in Devonshire by the Rev. J. M. Clanter.

S. ramosum (M.). This is by far the most beautiful variety, exactly analogous to the var. *cambricum* of *Polypodium vulgare*, and uniformly barren. The pinnæ are deeply pinnatifid, with narrow, incisoserrate segments. It has now been found in several localities: formerly, near Burnley, in Lancashire, by Mr. S. Gibson, and in Devonshire, by the Rev. W. S. Hore; subsequently, as we learn, by Dr. Kinahan, in Clare; and more recently near Settle, in Yorkshire, by Mr. A. Clapham; and in Borrowdale, Cumberland, by Miss Wright. It is the rarest of all known varieties, being difficult to cultivate, and infertile barren.

PLATE XL.

THE GREEN SPLEENWORT (ASPLENIUM VIRIDE).

ASPLENIUM, *Linnæus.*

Clusters of Spore-cases linear, oblong or elongate, straight, attached along the inner or anterior side of the veins or venules, furnished with an indusium or membranous cover. *Indusium* of the same form, entire or somewhat jagged on the margin opening along the inward side, or that towards the midvein or axis of venation. *Veins* disunited at their extremities, their branches (*venules*) simple or forked, sometimes furcately branched without a midvein.

A. VIRIDE, fronds linear, pinnate, pinnæ subrotund, roundish-ovate, or rhomboidal, crenated, distinctly stalked; rachis green, with an obtuse elevated green border in front, not winged, sori approximate to the midrib.

ASPLENIUM VIRIDE, *Hudson. Flora Anglica*, ed. 1, 395 ed. 2, 453. *Bolton, Filices Britannicæ*, 24, t. 14. *Smith, English Botany*, xxxii, t. 2257, *English Flora*, iv. 298. *Hooker and Arnott. British Flora*, 573. *Babington, Manual of British Botany*, 414. *Mackay. Flora Hibernica*, 244. *Deakin, Florographia Britannica*, iv. 71. *Newman, History of British Ferns*, 243. *Moore. Handbook of British Ferns*, 105. *Sowerby. Ferns*. 54. t. 31. *Schkuhr. Kryptogamische Gewächse*. 64. t. 72. *Willdenow Species Plantarum*, v. 332. *Sprengel, Systema Vegetabilium*, iv. 30. *Presl. Tentamen Pteridographiæ*. 108. *Fée. Genera Filicum*. 106.

ASPLENIUM TRICHOMANES RAMOSUM, *Linnæus. Species Plantarum*, 1542. *Bolton, Filices Britannicæ*, 25, t. 2, f. 2.

EXPLANATION OF THE PLATE.

PLATE XL. ASPLENIUM VIRIDE. **A**, from Merthyr Tydvil, *S. O. Gray*. **B**, from Ben Lawers, Perthshire, *T. M.* **C**, from the banks of the Ithing, Northumberland. *Rev. R. Taylor*. **D**, A VIRIDE MONSTROSUM, from Llanberis, North Wales cultivated, *Dr. Allchin*.

HABITAT.—The Green Spleenwort is found principally in the mountainous rocky districts of the north of England and Scotland, widely dispersed, and of frequent occurrence in congenial situations, but not generally abundant. It is also not unfrequent in Wales, and is found in Shetland (*Hb. S. F. Gray*). More southern stations are reported in the provinces of the Severn, Trent and Mersey: but in these it is very local. It has also been found on an old parapet wall at Danny near Brighton, and in the fissures of an old wall at Micklehurn, in Surrey: and Plukenet records a similar habitat at Maidstone in Kent. In Ireland it appears to be a rare plant, though occurring in the counties of Donegal, Sligo, Cork and Kerry. Mr Watson records its greatest altitude as about 2850 feet.

GEOGRAPHICAL DISTRIBUTION.—This Fern is a native of the whole of northern and central Europe extending to Italy and Spain. It is again found in India, in Kumaon (*Hb. Hooker*), in Tartary and in Eastern Siberia, and in the Island of Sitka (*Ledebour*); whence it extends to North-West America and the Rocky Mountains (*Hb. Hooker* and *Mus. Brit.*).

Caudex tufted, somewhat creeping, sparingly scaly at the crown. *Scales* lanceolate, dark brown, cellulose. *Fibres* slender, branched.

Stipes variable, sometimes quite short, usually about a third of the length of the frond, smooth, dark brown at the base, green upwards, semiterete, terminal and adherent to the caudex. *Rachis* green, slender, slightly grooved in front.

Vernation circinate.

Fronds two or three inches to eight or ten inches long, linear, pinnate. *Pinnæ* delicately herbaceous, pallish green, variable in form, usually roundish-ovate, and somewhat cuneate at the base, or more obliquely cuneate there, thus becoming sub-trapeziform or rhomboidal, distant and usually opposite below, more crowded and alternate above, attached by a distinct slender stalk, the margin crenated or inciso-crenate, except at the cuneate base, which is entire. Occasionally the pinnæ are equal-sided and broadest at the base, much shortened and rounded at the apex, and sometimes they are more elongated and acute.

Venation consisting of a midvein, producing forked *veins* at the base of the pinnæ and simple ones above, these veins and venules terminate abruptly within the margin, the point of termination being

marked by an elevation on the upper surface. On the anterior side of the vein, opposite the furcation and extending below it when forked, and near to the midrib when the veins are simple, the sori are produced.

Fructification more copious on the upper part of the frond. *Sori* linear oblique, contiguous to the midvein and soon becoming confluent, indusiate. *Indusium* narrow, crenated on the free margin. *Spore-cases* [illegible]. *Spores* angular, rough.

Duration. The caudex is perennial. The fronds are produced in spring, and remain fresh through the winter, the plant thus being evergreen.

Though similar to *A. Trichomanes*, this plant may be distinguished by its green rachis, by its more ovate herbaceous texture, by the absence of a slender raised border to the anterior face of the rachis, and by the more central situation of the sori, which are placed rather below than above the fork of the veins. It is always of a much paler colour.

At home on the mountain sides of the north this delicate species does not bear so well as others the atmosphere of lowland cities. Hence, except in favourable localities not affected by smoke, the plant will not bear exposure. It is generally found necessary to cultivate it under glass, a cold frame occasionally ventilated, and with the atmosphere moderately moist, being most suitable for it. The soil should be of a rocky nature, and no stagnant water should be suffered to remain about it. It may be increased by division.

For pot culture in a moist shady greenhouse or frame, a soil composed of equal parts of loam, peat, silver sand, and sandstone rock broken up into lumps of one or two inches diameter, should be employed, and the pots must be well drained, because, as it is necessary that the roots should be kept moist, provision must be made for the free passage of the water applied, so that it may not stagnate. The proportion of rocky material, for which soft broken brick is a passable substitute, may be even increased with advantage, the object being to provide for the draining of the moisture away from the crowns, whilst it saves the absorbing fibres of the roots.

In out-door rockeries such species as the present would be benefited by the use of a kind of bell glass provided with a vent at the top, which may either be opened or closed at pleasure. The use of such a glass would be to retain something like a moist atmosphere about the plants during the arid summer months, and to shield the crowns from excess of wet in winter. If the aperture, or apertures, were but of moderate size both these objects would be secured without ever closing the glass, and thus risking another evil which follows mountain plants when brought under artificial culture away from their pure and airy habitats—that of suffocation from too close confinement.

The varieties of this Fern are not numerous. Mr Wollaston has communicated the following notes:—

1. *multifidum* (W.) is pinnately or multifidly divided towards the apex of the frond, and is rather more lax than the usual growth of the species. It is almost as frequent as the common normal form, and is sub-permanent under cultivation.

2. *bipinnatum* (Clowes). The pinnæ of this variety are deeply incised, very much as in the incised variety of *A. Trichomanes*; this however is fertile. It was found on Whitbarrow, in North Lancashire, by Mr. I. Huddart, in 1863, and was in the possession of Mr. Clowes, of Windermere.

3. *acutum* (M.). Mr. Newman notices a variety found by the late Mr. S. Gibson, in which the pinnæ were "lanceolate and acute."

NATURE PRINTING.

Asplenium viride.

Plate XLI a.

THE WALL RUE OR SPLEENWORT
(Asplenium Ruta-muraria).

ASPLENIUM, *Linnæus.*

Clusters of Spore-cases linear oblong or elongate, straight, attached along the inner or anterior side of the veins or venules, furnished with an indusium or membranous cover *Indusium* of the same form entire or somewhat jagged on the margin, opening along the inward side, or that towards the midvein or axis of venation *Veins* disunited at their extremities, their branches (*venules*) simple or forked sometimes furcately branched without a midvein.

A. RUTA-MURARIA, fronds deltoid, bi-tri-pinnate, pinnules obovate, or rhomboid, wedge-shaped and entire at the base, the anterior margins acute rounded or truncate toothed, sori linear crowded, central [illegible] crenulate on the free margin

Asplenium Ruta-muraria, *Linnæus, Species Plantarum* [illegible] *Bolton, Filices Britannicæ* [illegible] 16. *Smith, English Botany*, [illegible] *Hooker, Genera Filicum*, 30. *Hooker and Arnott, British Flora*, [illegible] *Babington, Manual of British Botany* [illegible] *Newman, History of British Ferns*, [illegible] *Moore, Handbook of British Ferns*, [illegible] *Sowerby, Ferns of Great Britain*, 55 32 *Willdenow, Species Plantarum* 341 *Schkuhr, Kryptogamische Gewächse* 75, [illegible] *Sprengel, Systema Vegetabilium*, [illegible] *Presl, Tentamen Pteridographiæ*, 108 [illegible] *Filicum*, 90 [illegible] *Botany of Northern United States* 627

Asplenium murorum, *Lamarck, Flore Française* [illegible]

Asplenium Ruta-muraria, *Bernhardi, Schrader's Journal für die Botanik* 1806 [illegible] *Salisbury, Prodromus*, 403 [illegible] *Natural Arrangement of British Plants* [illegible] 14. *Stokes, Botanical Materia Medica* [illegible] 310.

Scolopendrium Ruta-muraria, *Roth, Flora Germanica*, [illegible]

Amesium Ruta-muraria, *Newman, History of British Ferns*, 2 ed. 10 3 ed. [illegible] *Appendix to Phytologist*, 1852 [illegible]

Tarachia Ruta-muraria, *Presl, Epimeliæ Botanicæ* 81

Adiantum [illegible] *Linnæus* MS. in Herb.

EXPLANATION OF THE PLATE.

Plate XLI A. [illegible] Asplenium Ruta-muraria [illegible] from [illegible] Kent, Commemoration [illegible] 2, from Albury Surrey [illegible] from Arundel Sussex [illegible] *Mr. Keen* 5 from Keswick Cumberland *Miss Wright* 6, from Town Malling, Kent *Dr. Allchin*. 7 A. Ruta-muraria [illegible], from Shalford, Surrey *Dr. Allchin* 8. A. Ruta-muraria [illegible] from Murrisk Ireland *Dr. Allchin*

HABITAT The Wall Rue is generally distributed through Great Britain and Ireland, less frequent on the eastern side of England according to Mr. Newman, and rare in the Highlands, according to Mr. Watson [illegible] grows on rocks and [illegible] and in abundance on old walls. Its range of altitude is estimated to extend from the coast level, about 600 feet or upwards above it.

GEOGRAPHICAL DISTRIBUTION — This Fern is spread over the whole of Europe, from Finmark [illegible] It is found in Kashmir and Thibet (*Dr. Hooker*) [illegible] in the Caucasus [illegible] provinces of Asiatic Russia, as well as on the Asiatic side of the Ural Mountains and in the regions of the Altai and of Lake Baikal in Siberia. According to Munby it grows in Algeria. It is also met with in North America in Pennsylvania, Virginia and Kentucky (*Dr. Hooker*).

Caudex short, thick, tufted, scaly *Scales* small, very dark brown, narrow lanceolate, striate-reticulate. *Fibres* wiry branched.

Stipes as long as, or longer than the frond, smooth, dark purple at the base, green above. *Rachis* smooth, green

Vernation circinate.

Fronds one to six inches long, numerous, terminal, adherent to the caudex, deep green, sub-coriaceous, often coriaceous, deltoid, bi-tri-pinnate, when young, simple and reniform, or trifoliately pinnate, with roundish or sub-reniform leaflets, the latter state fertile. *Pinnæ* alternate. *Pinnules* obovate or rhomboidal, the base wedge-shaped, entire and tapering into a more or less distinct petiole, the apex rounded, or acutely prolonged, or truncate, always toothed, with the teeth small and nearly equal

THE WALL RUE OR SPLEENWORT

Venation consisting of a series of *veins* repeatedly forked from the base, so that there is no distinct midvein, the number of branches or *venules* corresponding with the number of marginal teeth.

Fructification on the back of the frond, borne on the inner sides of the venules about the centre of the pinnae. *Sori* linear, few sometimes simulating those of *Scolopendrium* from being nearly opposite contiguous and opening inwardly from each margin, often becoming confluent. When the plants are starved, they produce small pinnules and abundant sori, which are confluent over their whole under surface. *Indusium* a thin narrow membrane having the free margin wavy or crenulate. *Sporeceses* dark brown, numerous, roundish, obovate, coarsely reticulate. *Spores* roundish, strongly muriculate.

Duration. The caudex is perennial. The fronds are produced in spring and retained through the winter until after fresh ones appear, so that the Fern is evergreen.

The usual states of this species are easily recognised, the characters of deltoid outline, bipinnate division and distinct cuneate pinnules, taken together with the small size of the entire fronds, serving to distinguish these from the other *Asplenium*s. There are, however, states of the plant which are not easily separated from *A. germanicum*, being narrow in the fronds or pinnules, and sometimes scarcely more than pinnate. These states are best distinguished by the crenulate indusium, and by the fine denticulations of the upper margin, the apex of the pinnules in *A. germanicum* having fewer, deeper and more unequal incisions.

Some cultivators succeed well with this plant, but it is not generally found easy of culture. Those succeed best who keep their Ferns drier than usual. The Wall Rue requires a very porous soil of sandy loam, with a large proportion of old mortar and fragments of soft brick, and to have the watering-pot applied very cautiously to the soil, and perhaps never to the leaves. The plants, too, ought to have an open or elevated site, especially if in a house or frame, so that they may be continually parting with the moisture supplied to them. They increase by division.

A few variations of this species have been noticed, and they are as follows:—

1. *multifidum* (W.). This produces occasionally a few dichotomous fronds, but the plant is not entirely dichotomous, nor is it constant under cultivation.

2. *cristatum* (W.). This is permanent, and nearly all the fronds are affected; some are crowded or tasselled at their apices; others have their apical lobes, as it were, folded on each other, and the rachis is not unfrequently divided. The pinnules vary somewhat in nearly every plant. It has been found by Dr. Allchin near Guildford in Surrey, and by Mr. Wollaston near Tunbridge Wells, Kent, and is rare.

3. *proliferum* (W.), is a proliferous form of the foregoing; the young plants protrude through the epidermis or are seated at the axils of the pinnules. It was found sparingly mingled with the last.

4. *dissectum* (W.). This is of very elegant habit; the pinnules are deeply incised and elongated. It has been found by Mr. Wollaston in Devonshire, and by Dr. Kinahan in Ireland, and is not common.

5. *cuneatum* (M.). This form, which comes from Stenton Rock, is often mistaken for *A. germanicum*; it is scarcely more than pinnate, with narrow pinnae cuneate below, truncate above. The texture, however, is stouter than in *A. germanicum*, the parts broader, and the apical teeth, unlike those of that species, are small and equal. Another similar form from the same place is rather more divided, and less truncate; specimens similar to this last have been found by Dr. Allchin at Town Malling, Kent, and by Miss Wright, at Keswick. A still narrower but analogous form has been found by Mr. Wilson in Dovedale, and by Dr. Allchin at Ennis.

6. *pinnatum* (M.). A pinnate variety, with several rhomboidal pinnae, stalked, and crenato-dentate in the upper or larger half. It was found by Dr. Allchin at Mucruss.

7. *unilaterale* (M.). This was found with the last. It is one-sided in its growth, developing a normal pinna on one side, the rest of the frond being confused, and the rachis often excurrent and hooked at the point; sometimes the pinna becomes an enlarged branch. The whole growth is irregular and monstrous. A somewhat similar form has been gathered by Mr. Barrington at Black Head, Clare, Ireland.

URE PRINTING.

A. Asplenium Ruta-muraria. B. A. germanicum. C. A. septentrionale.

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PLATE XLI B

THE ALTERNATE-LEAVED SPLEENWORT

(ASPLENIUM GERMANICUM).

ASPLENIUM, *Linnæus.*

Clusters of Spore-cases [illegible] oblong or elongate, straight, attached along the inner or exterior side of the veins or venules [illegible] and [illegible] membranous covers. *Indusium* of the same form, [illegible] or somewhat [illegible] margin, opening along the inward side [illegible] towards the [illegible] axis of [illegible]. *Veins* [illegible] at their extremities, their branches (*venules*) simple or forked, sometimes [illegible] branched, without a [illegible].

A. GERMANICUM, fronds linear oblong, broadest at the base, pinnate or [illegible] pinnae [illegible] ascending, narrow wedge-shaped, toothed at the apex, entire below, the lower ones three-cleft; sori [illegible] entire.

[illegible] *Systema* [illegible] *British Plants,* [illegible] *Newman, History of British Ferns,* 2 [illegible] *Deakin, Florigraphia Britannica,* [illegible] *Babington, Manual of British Botany* [illegible] *Moore, Handbook of British Ferns,* 169. [illegible] *Species Plantarum,* [illegible] *Sprengel, Systema* [illegible] *Peral. Tentamen Pteridographiae* [illegible]

ASPLENIUM [illegible] *Hooker and Arnott, British Flora,* [illegible] *Sowerby, Ferns of Great Britain,* [illegible]

ASPLENIUM [illegible] *Helvet.* [illegible] *Botanica* [illegible] *Swartz, Synopsis Filicum,* [illegible] *Fee, Genera Filicum,* 190.

ASPLENIUM GERMANICUM, *Newman, History of British Ferns,* [illegible] *Phytologist* [illegible]

[illegible] *Roth, Flora Germanica,* [illegible]

[illegible] *Prea. Synopsis Botanica,* 70.

EXPLANATION OF THE PLATE.

PLATE XLI. B. ASPLENIUM GERMANICUM. [illegible] from Stenton Rock, cultivated; 2, from Switzerland [illegible] *Moore.*

HABITAT. This is one of the rarest of British Ferns, but few stations and few plants having been discovered. The records of its occurrence are as follows: [illegible] North Wales [illegible] Wilson, and near [illegible] by Mr. Williams [illegible] by Mr. [illegible] Smith and Miss Wright [illegible] by Mr. G. B. Tate [illegible] of Scotland, near [illegible] Crags, by Mr. W. [illegible] by Dr. [illegible] of Stenton Rock, near Dunkeld, Perthshire; Mr. [illegible] found *A. [illegible]* near [illegible] on rock almost inaccessible, near [illegible] Castle, [illegible] been approximately computed as between 300 and 600 feet [illegible] and it probably reaches at least an elevation of 1000 feet [illegible]

GEOGRAPHICAL DISTRIBUTION. The Alternate-leaved Spleenwort appears to have been found sparingly in most of the European countries, as far north as [illegible], but we have no information of its occurrence in other parts of the world.

Caudex tufted, short, [illegible] scaly. *Scales* small, narrow lanceolate, dark brown, striato-reticulate. *Fibres* slender, branched.

Stipes terminal and adherent to the caudex, slender, [illegible] often [illegible] as long as the frond, dark purplish brown below, green above, [illegible] as well as the *rachis* smooth.

Vernation circinate.

Fronds from two to six inches high, narrow, linear-oblong, somewhat broadest at the base, pinnate, subbipinnate, or when very luxuriant bipinnate below, pale green, scarcely sub-coriaceous. *Pinnæ* alternate, ascending, remote, the lower ones largest and most developed, [illegible] small plants [illegible] obovate

or cuneate, cut into two or three narrow lobes, the lobes simple or toothed, the apex unequally toothed, the base tapering into a kind of [illegible] the larger pinnæ are more distinctly stalked, and sometimes [illegible]ly bipinnate with one distinct cuneate pinnule. The upper pinnæ are less and less lobed, but [illegible] the apex, as well as blunt and they are falcately curved inwards. The apex of the frond consists of several coalescent narrow lobes.

Venation consisting of four series of furcate divisions of the vein which constitutes the vascular bundle of the footstalk, without a midvein, a vessel extending to each of the teeth, so that the pinnule is occupied by from two to five or six [illegible]ately-forked nearly parallel venules.

Fructification on the back of the frond occupying all the pinnæ. *Sori* linear elongate, on two or three of the central venules, opening inwardly from each margin, at length confluent. *Indusium* a thin narrow membrane with the margin entire or somewhat wavy. *Spore-cases* obliquely obovate brown. *Spores* roughish or muriculate, roundish-oblong.

Duration. The caudex is perennial. The plant is evergreen or sub-evergreen, the fronds being more or less persistent.

This plant, though almost invariably kept distinct by writers on Ferns, has often, by the same pen which has so placed it, been marked as a suspicious species, having a supposed relation either to the Wall Rue, or the Forked Spleenwort. Without doubt it stands intermediate between these, but seems to us perfectly distinct. It is a subbipinnate form of the Wall Rue (var. *cuneatum*), only, which resembles it and that in all [illegible] by a thicker and stouter plant, not lobed as this is, and with the apico-marginal teeth much more uniform. The Forked Spleenwort is much more coriaceous and less leafy in habit, being in truth rather rachiform than foliaceous, and its teeth, when present, very different, being rather of the nature of distant linear fragments split away from the margin, than serratures, which the few teeth of *A. germanicum* more nearly resemble.

This rare Fern is one which does not thrive under cultivation, except with careful management. If potted in porous soil with the crown well elevated and covered by a bell-glass in a shaded frame, or put in a warm close house or pit without a bell-glass, it will generally grow with vigour, but the plants are very liable to perish in winter. The safeguard is, not to allow water to reach their crowns, to keep their roots just moderately moist, and not to suffer the bell-glasses employed to protect them from the risk of being wetted, to injure them by retaining a constantly damp atmosphere, which they will do if they are kept permanently closed. The plan of using glasses, with a couple of small apertures opposite each other as vents, near the top, so successfully adopted by Mr. Clowes in cultivating *Hymenophyllum*, would no doubt be found congenial to these difficult mountain *Asplenums*. The plants may be increased by division of [illegible] crowns.

PLATE XLI. c

THE FORKED SPLEENWORT

(ASPLENIUM SEPTENTRIONALE).

ASPLENIUM, *Linnæus.*

Clusters of Spore-cases linear, oblong or elongate, straight, attached along the inner or anterior side of the veins or venules, furnished with an indusium or membranous cover. *Indusium* of the same form entire or somewhat jagged on the margin, opening along the inward side, or that towards the midvein or axis of venation. *Veins* disunited at their extremities, their branches (*venules*) simple or forked, sometimes furcately branched without a midvein.

A. SEPTENTRIONALE fronds linear, simple, or two- or three-cleft or forked, with linear cleft divisions, segments alternate, ascending, elongate and rachiform, with a few deep narrow distant teeth, sori few, elongate, often parallel, indusium entire.

ASPLENIUM SEPTENTRIONALE. *Hoffmann, Deutschlands Flora*, ii. 12. *Hull, British Flora*, 211. *Smith, English Botany*, xv. t. 1017. *English Flora*, v. 295. *Gray, Natural Arrangement of British Plants*, ii. 14. *Hooker and Arnott, British Flora*, 572. *Babington, Manual of British Botany*, [illegible]. *Drakin, Floriographia Britannica*, v. 71. *Newman, History of British Ferns*, 2 ed. 260. *Sowerby, Ferns of Great Britain*, 58, t. 34. *Moore, Handbook of British Ferns*, 141. *Schkuhr, Kryptogamische Gewächse*, 62, t. 6[illegible]. *Willdenow, Species Plantarum*, v. 307. *Sprengel, Systema Vegetabilium*, iv. 8[illegible]. *Pearl, Teutonica*, 106, t. 3, *fig.* 8.

ACROSTICHUM SEPTENTRIONALE. *Linnæus, Species Plantarum*, [illegible]24. *Bolton, Filices Britannicæ*, 12, t. 8.

ACROSTICHUM VARIOLATUM. *Gilibert, Exerc. Phytol.* ii. 555.

PTERIS SEPTENTRIONALIS. *Smith, Mémoires de l'Académie Royale des Sciences de Turin*, v. 112 (in obs.).

SCOLOPENDRIUM SEPTENTRIONALE. *Roth, Flora Germanica*, iii. 40.

ACROPTERIS SEPTENTRIONALIS. *Link, Hortus Regius Berolinensis*, ii. 56; *Filicum Species*, 80. *Fée, Genera Filicum*, [illegible], *fig.* 1.

AMESIUM SEPTENTRIONALE. *Newman, History of British Ferns*, 2 ed. 10; 3 ed., 265. *Appendix to Phytologist*, [illegible].

BLECHNUM SEPTENTRIONALE. *Wallroth, Bluff et Fingerhuth Compendium Florae Germanicae*, iii. 24 (Ledeb.).

EXPLANATION OF THE PLATE.

PLATE XLI. C.—ASPLENIUM SEPTENTRIONALE. 1, from Borrowdale, Cumberland. *Miss Wright*. 2, from Arthur's Seat, Edinburgh. *J. T. Syme*. 3, from Llanwrst, Denbighshire. *B. & Gray*. 4, from Craigdhu, Lanberis. *S. O. Gray*.

HABITAT. A rare species but widely distributed, being found in Somerset and Devon, in North Wales, in the Lake District, Yorkshire and Northumberland, in Roxburghshire and about Edinburgh, in Perthshire, and at the Pass of Ballater, in Aberdeenshire, which is the most northern station yet certified, though it has been reported from Orkney, as it also has from Forfarshire. It reaches an elevation of upwards of 3000 feet, and descends nearly to the sea level in North Wales. It does not appear to occur at all in Ireland. The situations in which it is found are fissures of rocks, and the interstices of loose stone walls.

GEOGRAPHICAL DISTRIBUTION.—This is a not uncommon European plant, occurring abundantly in some of the mountainous tracts of central Europe, and extending from the northern kingdoms to Italy, Spain, and Hungary. In Asia, it is found in Northern India, Kashmir, Kumaon (*viz. Hooker*), and in the regions of the Caucasus, the Ural, and the Altai. It occurs in New Mexico (*Hon. Lindley, Hooker*).

Caudex short, thick, tufted, often forming large dense scaly masses. *Scales* small, narrow lanceolate, dark brown, striato-reticulate. *Fibres* numerous, wiry, branched.

Stipes terminal, adherent to the caudex, dark brown-purple at the base, green above, as long as, or longer than the frond.

Vernation circinate.

Fronds from two to six inches high; sometimes simple, and then either entire or with a few distant marginal subulate teeth appearing as if split away from the main portion, or divided into two or three narrow-linear alternate ascending lobes; sometimes forked, with the two divisions either simple, toothed or lobed on the same plan as the simple fronds. They are numerous, deep green; the simple ones

narrow, linear, tapering towards both ends, the forked ones indefinite in form, and apparently one-sided one of the divisions being smaller than the other, and looking like a lateral branch without a balancing branch from the other side of the rachis. The lobes are sometimes so much separated as to look like distinct pinnæ

Venation consisting of two or three series of furcate divisions of the vein which enters from the base, one of the venules extending to each of the teeth, there being no midvein

Fructification on the back of the frond. *Sori* linear elongate, on the inner side of two or three of the few venules, and opening towards the centre, towards the apices they are often opposite and contiguous almost as in *Scolopendrium* in consequence of the narrowness of the parts, and bearing crowded with numerous spore-cases, they become confluent, and appear to be universal as in *Acrostichum*, but these are mere similarities. *Indusium* linear, entire. *Spore-cases* roundish-obovate, dark-brown *Spores*, roundish-oblong, slightly muricate

Duration. The caudex is perennial. The fronds are persistent; the plant is, therefore, an evergreen

This plant may be distinguished at first sight by its tufted grassy aspect. From its ally *A. germanicum*, which some botanists would consider a variety of it, the Forked Spleenwort may be known by its fronds being either simple, with mere lobes, or forked with two distinct branches, each like its own smaller fronds, and never being regularly pinnate as is *A. germanicum*. It is also narrower in its parts, with the texture thicker and less leafy

As in the case of the allied species, many persons fail to cultivate this Fern with success. The failure probably arises from the use of fine soil in too large masses. Naturally this is a rupestral plant and this condition should be imitated by its being planted among masses of porous sandstone, in the interstices of which only a little sandy soil should be placed. It would no doubt be also an advantage to plant somewhat horizontally rather than too strictly vertical, and to allow the upper fragment of stone employed, to be large enough to serve as a shade to the crown from the sun's rays, these latter in summer acting too powerfully on the soil contained in small pots. This amount of shade would admit of the plants being kept in a more exposed situation than is usually safe, from the cause just referred to, and thus the evils arising from close dampness and want of ventilation would be remedied. The exposure, however, must be modified judiciously. for instance, a greenhouse where the atmosphere is dried and moistened daily, would probably be found congenial, or a cold frame well aired, and slightly shaded, might with advantage be substituted for the closer frame and denser shade, which is more usual. Certainly many Ferns do not need so much shade as is given in a general collection, to suit the more tender kinds, and the partial shade afforded by a lump of stone on the sunny side of the crown of a small Fern would be more congenial to many of the mural or rupestral species, than a more general exclusion of the sun's rays. Mr. Watson notices that the young fronds are easily damaged by frost

PLATE XLII

THE COMMON HART'S-TONGUE FERN
(SCOLOPENDRIUM VULGARE).

SCOLOPENDRIUM, *Smith.*

Clusters of Spore-cases linear or oblong, straight, growing in proximate parallel pairs on the anterior and posterior branches of adjacent fascicles of veins, indusiate. *Indusium* linear, attached to the venules on opposite sides of the proximate sori, the free margins face to face, at first connivent, at length separating down the centre of the twin sorus, which becomes confluent into a [illegible] *Veins* two or three times forked from the prominent midvein, [illegible] parallel, [illegible] at their apices, which are club-shaped (rarely anastomosing [illegible]).

S. VULGARE, fronds very variable, normally [illegible] linear or oblong strap-shaped, entire at the margin, attenuate at the apex, cordate at the base, smooth or slightly hair-scaly on the midrib beneath; stipes shaggy with narrow scales.

SCOLOPENDRIUM [illegible] Smith, [illegible] *Turin*, [illegible] *fig.* 2 [illegible] *English* [illegible] *Natural Arrangement of British Plants*, ii. [illegible] *Hooker and* [illegible] *British Flora*. [illegible] *British Botany*, [illegible] *Flora* [illegible] *History of British Ferns*, [illegible] *Moore, Handbook of British Ferns*, [illegible] *Sowerby*, [illegible] *Britain*, 59, [illegible]

SCOLOPENDRIUM [illegible] *Schrader's Journal für die Botanik*, [illegible] *Synopsis Filicum* [illegible] *Species Plantarum* [illegible] *Sprengel, Systema Vegetabilium*, [illegible] *Presl, Tentamen Pteridographiae* [illegible] *Hooker* [illegible] *Plantarum* [illegible] [illegible] *Gray, Botany of Northern* [illegible] *States*, 626.

SCOLOPENDRIUM [illegible] *Flora Germanica*, iii. 47.

SCOLOPENDRIUM [illegible] *De Candolle, Flore Française*, ii. 552.

SCOLOPENDRIUM [illegible] *Cavanilles, Prelectiones* [illegible] *Plantas demostradas en las Lecciones Publicas*, 1801 [illegible]

SCOLOPENDRIUM [illegible] *Filicum* [illegible] 509, [illegible]

ASPLENIUM SCOLOPENDRIUM, *Linnaeus, Species Plantarum*, 1537. *Bolton, Filices Britannicae* [illegible]

ASPLENIUM ELONGATUM, *Salisbury, Prodromus*, 402.

[illegible] *Stokes, Botanical Materia Medica* [illegible]

PHYLLITIS SCOLOPENDRIUM, *Newman, British Ferns*, [illegible] *Phytologist* [illegible]

Var. **POLYSCHIDES**, fronds linear strap-shaped, subtruncate at the base, the margin distantly lobed, and irregularly crenate; fertile.

PHYLLITIS POLYSCHIDES, *Ray, Synopsis*, [illegible]

SCOLOPENDRIUM [illegible] *Gray, Natural Arrangement of British Plants*, [illegible] *Moore, Handbook of British Ferns*, [illegible] *fig.* [illegible] *Nature-Printed British Ferns* [illegible] *Sowerby, Ferns*, [illegible]

Var. **CORNUTUM**, fronds strap-shaped, crenated or lobate, usually obtuse, with the midrib excurrent below the apex, forming a horn projecting from either surface.

Var. **MARGINATUM**, fronds linear strap-shaped, truncate at the base, the margin incise-lobate, the epidermis of the under surface near the margin developed into a lobed excurrent membrane, which, as well as the frond itself, bears sori.

SCOLOPENDRIUM VULGARE [illegible] *Moore, Handbook of British Ferns*, 1.4.

Var. **CRISPUM**, fronds strap-shaped, the margins undulated, the base strongly auriculato-cordate, usually barren.

PHYLLITIS [illegible] *J. Bauhin, Historia Plantarum*, iii. 749.

SCOLOPENDRIUM [illegible] *Gray, British Plants*, [illegible] *Moore, Handbook of British Ferns*, [illegible] *fig.* [illegible] *Sowerby, Ferns*, [illegible] *Nature-Printed British Ferns* [illegible]

SCOLOPENDRIUM [illegible] *Willdenow, Species Plantarum* [illegible]

Var. **MULTIFIDUM**, fronds irregular, usually many times furcately divided, the divisions plane or variously crisped, [illegible] fertile; stipes sometimes ramose.

[illegible] *Ray, Synopsis*.

SCOLOPENDRIUM [illegible] *Gray, British Plants*, [illegible] *Moore, Handbook of British Ferns*, [illegible] *Sowerby, Ferns*, [illegible]

SCOLOPENDRIUM [illegible] *Nature-Printed British Ferns*, [illegible] 79, *fig.* [illegible] *Moore, Handbook of British Ferns*, [illegible] 178, *fig.* [illegible] *Sowerby, Ferns*, [illegible]

[illegible]

[illegible] **LACERATUM** fronds strap-shaped or broadly ovate (on same plant), the margin deeply inciso-lobate, the lobes unequally prolonged, sometimes crisped, apex multifid-crisped, basal pair of lobes sometimes much enlarged, and multifid-crisped at their apex.

[illegible]

EXPLANATION OF THE PLATE.

PLATE XLII. [illegible]

HABITAT. [illegible]

GEOGRAPHICAL DISTRIBUTION. [illegible]

Caudex thick, short, tufted, often decumbent, scaly at the crown. *Scales* lanceolate-acuminate, pale purplish-brown, shining, finely reticulato-venose. *Fibres* short, branched, numerous, dark brown.

Stipes averaging about one-third the length of the frond, but varying from about one-fourth to one-half its entire length, usually clothed with pale tawny contorted subulate scales, sometimes smooth, purplish-brown, darkest at the base, terminal, and adherent to the caudex. *Rachis*, or more correctly *midrib*, stout, scaly behind when young, often dark-coloured below.

Vernation circinate.

Fronds from about four inches to two feet or upwards in length, narrow elongate-lanceolate, or broadly linear or oblong strap-shaped, normally entire, or [illegible] apex more or less attenuated, and terminating in an acute point, and having the base cordate, plane, fleshy or coriaceous, deep rich green. The varieties deviate in unnumbered forms, by the laceration or undulation of the margin, the multifid dilatation of the apex, the branching (often repeated) of the stipes and midrib, the loss of the cordate lobes at the base, and the arrest of longitudinal development.

Venation parallelo-furcate, that is, the *veins* which spring from the midrib are one, two, or three times forked near the base, and the *veinlets* thus produced extend side by side nearly to the margin and almost at a right angle, terminating in club-shaped apices. In the enlarged base of the frond the furcations are more numerous.

Scolopendrium vulgare.

THE COMMON HARTS-TONGUE FERN

Fructification dispersed over the back of the frond,* most abundant upwards. *Sori* linear, oblique, unequal in length, twin, that is, growing in pairs, the two contiguous parallel sori borne on the posterior and anterior venlets of adjacent fascicles of veins, and becoming confluent into one broad linear mass. *Indusium* also double, narrow, entire, the two opening face to face, at first connivent, at length separating down the centre of the twin sorus, finally pushed back and hidden by the spore-cases. *Spore-cases* numerous, obovate, reddish-brown. *Spores* roundish or oblong, muriculate.

Duration. The caudex is perennial. The fronds are persistent, the young ones being produced in April, and remain long after others succeed them; the plant is therefore strictly evergreen.

The common Hart's-Tongue is at once known from all other British Ferns by its long strap-shaped succulent-looking fronds, and technically by its linear twin sori. Its varieties are endless. Those we have thought deserving of [illegible] are to be considered rather as types of variation than as individual forms, comprising a series of analogous subvarieties, which, however, being permanent and easily cultivated, are individually prized as garden ornaments. We omit any lengthened description of them on this account, and also because they will be included in the following notes on the whole of the forms or subvarieties [illegible] which have been [illegible] drawn up by Mr Wollaston, of Chislehurst, whose own collection contains one of the most extensive series of them. The principal private collections of living Scolopendriums, known to us, besides that just mentioned, are those of Dr Aitchin, of Bayswater, Mr Gray, of Hammersmith, Mr Clapham, of Scarborough, Mr. James and Mr Jackson, of Guernsey, the Rev J M Chanter, of Ilfracombe, and Sir W C Trevelyan, of Nettlecombe, to whom and to many other correspondents, we are indebted for specimens.

1 *polyschides* (Ray). This old and familiar variety, known to the illustrious Ray, and named in allusion to the numerous deep incisions on the margin of the frond—known also amongst gardeners under the name of *angustifolium*, in allusion to its narrow fronds—is taken as the type of a group in which the fronds are more or less incised on their margins, but not in the least degree marginate (that is, having the epidermis disrupted). The fronds in this variety are linear strap-shaped, slightly undulate, irregularly crenato-lobate, with the margin crenately toothed; it is fertile, and the masses of spore-cases often protrude between the incisions to the face of the frond. The venation is here and there reticulate. It is remarkably constant under cultivation, and universally reproduces itself from its spores. Its early history is lost. The late Mr. D Cameron found it near Bristol; a form almost identical has been met with by the Rev J M Chanter, near Ilfracombe, Devonshire, and Sir W Hooker has a specimen from Lismore.

2. *macrosorum* (Fee) is similar to *polyschides*, but the fronds are somewhat broader, and the margin is more frilled with an undulated series of bluntish teeth, which are deeper and more evident than in the variety just named. It has the same kind of deep occasional incisions, but they are less manifest, being hidden by the undulation of the margin; the base is truncate; the venation is normal, and the sori short oblong. The best grown form is of exotic origin, having been received from Bolwyller, but a very similar one has been found in Guernsey, in 1855, by Mr James. It is quite constant, and very neat.

3. *fissum* (M.) is a large, vigorous, and graceful form, in character resembling the two preceding, but the fronds are larger and broader, and usually blunt-ended; the margin is deeply incised and somewhat undulate, so that the incisions are not very evident, the whole being crenately toothed; the veins are slightly netted, and the sori grow in oval-oblong masses. It was found near Nettlecombe in Somersetshire, in 1852, by Sir W C Trevelyan, and similar forms have been gathered near Denbigh, by Mr T Pritchard, and in Guernsey by Mr C. Jackson. It is permanent, handsome, and rather rare.

* The fructification of Scolopendrium is normally [illegible] on the back of the frond [illegible] [illegible] deviation from this [illegible] occurs in several of the varieties, the sori being produced, and sometimes abundantly, on the upper as well as the lower surface. [illegible] [illegible] [illegible] [illegible] [illegible]

4. *obtusidentatum* (M.). A very pretty dwarfish narrow-fronded variety, having the margin shallowly sometimes deeply lobed, the lobes frequently separated by broad sinuses, and the whole notched with nearly uniform blunt conspicuous teeth; the apex is usually blunt, the midrib not reaching the end; the sori are longish masses irregularly placed. Found near Ilfracombe, in 1855, by the Rev. J. M. Chanter.

5. *subcornutum* (Tait). The peculiarity of this variety is its rigid coriaceous texture and upright habit. It resembles *denticulatum* (8) in the small even toothing of the margin; but the fronds are more incised or lobate; they also terminate abruptly and the rachis protrudes near the apex and forms a horn or hook on the under side. The fronds are sometimes furcate; sori few, scattered. Mr. A. Tait of Edinburgh first noticed it in the nursery of Mr. Sang at Kirkaldy.

6. *cornutum* (M.) is a very beautiful, as well as curious variety; the fronds are coriaceous, somewhat [illegible] crena[illegible] [illegible] [illegible] [illegible] [illegible]thed; they also usually terminate abruptly, the rachis projecting from the [illegible] [illegible] a long hook or horn, from which it takes its name. It fruits plentifully, and is a thoroughly constant variety, invariably reproduced from its spores. It was found in Yorkshire by Mr. Thorne, and probably elsewhere, as it is not uncommon in collections.

7. *imperfectum* (W.) is remarkable for the unfinished appearance of the margin of the frond, which is entire, as though cut away as far in as the sori. It was found in north Lancashire by Mr. Wollaston, in 1855, and promises to be a constant form. The fronds are linear, strap-shaped, somewhat irregular truncate at the base, sometimes abrupt and sub-cornute at the apex.

8. *denticulatum* (W.). This is of exotic origin, having been found near Geneva by the Rev. W. H. Hawker, but is so likely to be found in this country or so certain to be raised from spores, that it is here included. The plant is dwarf in habit, the frond ramose, denticulate, and occasionally incised, sometimes abrupt at the apex. As yet it has not fruited, but it is constant.

9. *stenophyllum* (M.). A very narrow linear form, cordate at the base, with broad shallow entire crenatures nearly to the point; sori normal beneath, with numerous small roundish sori near the margin above. It was found in Guernsey by Mr. J. James, of Vanvert.

10. *crenato-lobatum* (M.). An elegant form normal in size and general outline, but the margin, especially in the upper half, is strongly crenato-lobate, sometimes a little undulated. It is very distinctly suprasoriferous, the upper sori often large and distinct like the lower. It appears to be a frequent form, and has been found in Devonshire by the Rev. J. M. Chanter; Saltwood Kent, by Mr. F. Brent; Guernsey by Mr. C. Jackson; and Dorsetshire by Mr. Wollaston. It is sometimes very slightly marginal.

11. *turgidum* (W.)—so called from the thick or muddy appearance of the cellular tissue—is submarginate. The fronds, which are from six to eight inches long, are normal in outline, irregularly crenate or sub-lobate, and fleshy; the venation irregular and occasionally reticulate. It is quite distinct from all other varieties, and permanent under cultivation. It was found in Sussex, in 1854, by Mr. Wollaston.

12. *resectum* (M.) is so called from the absence of the usual auriculate lobes at the base of the frond; in other respects it resembles *sinuatum* (13) and *inæquale* (14), being irregular in width and development. It was found in Sussex, in 1854, by Mr. Wollaston, and is constant.

13. *sinuatum* (W.) differs from the ordinary form in having the margin of the frond (which is occasionally multifid) sinuate, the lobe-like sinuosities being irregular in development, entire or obscurely crenate. The venation is slightly confused in the contracted parts; but the sori are normal. Found in Sussex by Mr. Wollaston, in 1854, and in Yorkshire by Mr. Clapham; and is constant.

14. *inæquale* (A.). This handsome variety has the margin of the frond deeply incised, and distinctly and unequally lobed sub-pinnatifid; the apex generally multifid fimbriate; fructifications copious and irregular. It was found in Ireland by Dr. Allman in 1853, and is a constant and a rare plant.

15. *coriaceum* (James). A dwarf form, very remarkable when fresh for its coriaceous texture. It is irregularly [illegible], generally abrupt, slightly marginate, sparingly and irregularly sori[illegible], [illegible] on the under or upper surface, or actual edge of the frond. Found in Guernsey by Mr. James.

16. *laciniatum* (W.). A handsome variety, in which irregular portions of the frond are contracted.

these portions having the short distinct teeth or the shallow lobes of the *polyschides* type, while here and there other portions grow out to the normal width, and form blunt, rounded, or oblong projecting lobes or entire normal spaces of greater length. Sometimes the apex, or the base, or one side only, of the frond is affected, the example figured showing an instance in which the altered portions are less broken up than usual. Scarcely two fronds are alike, but the fronds are nearly always affected. It has been found in North Lancashire by Mr. Wollaston, in Yorkshire by Mr. Clapham and in Devonshire by the Rev. J. M. Channter.

17. *irregulare* (M.). This is one of those unaccountable freaks of nature which is at one time in its natural growth, and then in its most fantastic or the two conditions may be combined on the same plant. The abnormal fronds are irregularly lobate, with crenated or incised lobes, somewhat undulate, often forked, and altogether irregular. It is but sparingly fertile in the abnormal state. It was found in Guernsey by Mr. C. Jackson, and is only a sub-permanent form.

18. *corrugatum* (W.) presents a combination of the characteristics of *variabile* (39) and *crispum* (46), having fronds beautifully undulated, but also deeply cut into auriculate lobes on the margin, in a very irregular manner. The venation is slightly reticulate. Found in Sussex by Mr. Wollaston in 1854.

19. *poeciliferum* (M.). A large irregularly-lobed form, stout and rigid in texture, often forked, and somewhat supra-marginate; its chief peculiarity however, is the production on its under surface, of irregularly-placed crescent-shaped or rather trumpet-shaped excrescences, frequently a quarter of an inch in length. It was sent to us from Guernsey by Mr. J. James, of Vauvert.

20. *submarginatum* (W.). This form comprises several modifications, in which the fronds, various in character sometimes bifurcate, more rarely ramose, are only partially marginate: the perfect fronds are submarginate, that is, with their margins partially disrupted, crenato-lobate, especially towards the apex, supra-soriferous, the imperfect fronds sometimes similar to the perfect ones on one side of the rachis, and on the other narrow and irregularly dentate, others are truncate, submarginate, and obliquely cornute, and others again abortive, having nothing but a short scaly stipes without any of the leafy portion. This form was found in Sussex, in 1854, by Mr. Wollaston, in Ireland by Dr. Allchin, in Guernsey, by Mr. C. Jackson, and in the Isle of Wight, by Mr. R. Bloxam.

21. *uniforme* (W.). This is, perhaps, the most slightly marginate of the varieties referred to the *marginatum* group. The fronds, which are rarely a foot long, are lance-shaped, laterally waved or subflexuose slightly crenate, and obsoletely though continuously marginate beneath. They are also supra-soriferous, that is, the fructification protrudes itself to the face of the frond, but the upper sori are very small. The base of the frond is rarely auricled, and the whole plant has a very unusual appearance. It was found in Guernsey by Mr. C. Jackson, in 1854, and is doubtless a constant form.

22. *meredon* (M.) is a small form, possessing many of the characteristics of *submarginatum* (20), but having the apex of the frond multifid. Its chief peculiarity is the minutely sulcate portion of the frond immediately below the forking. Found in Ireland by Dr. Allchin, in 1853, and quite constant.

23. *contractum* (W.). This variety resembles *submarginatum* (20) in size and in its submarginate fronds and *marratum* (22) in its multifid apex. It has been named *contractum* on account of having its fronds drawn in or waisted like just below their densely-multifid apices, the mass of veins which have to pass this contracted portion, become protruded or ridged, giving that part the appearance of being supra-incate. This also was found in Clare, Ireland, by Dr. Allchin in 1853, and is permanent.

24. *marginatum* (M.). This is the type and most remarkable form of the marginate group, and although but recently noticed, must have been long known, as a garden specimen received from the younger Linnæus is in Sir J. E. Smith's Herbarium. Several subforms are known in cultivation, of which the most marked in characters is that described as in our *Handbook of British Ferns*: "The fronds grow erect a foot or more in height, and stand in a circle round the crown; they are simple strap-shaped, the margin irregularly lobed, the under surface producing within the margin an excurrent membrane, which is also lobed. Both surfaces of this membrane, and the under surface of the frond itself exterior to it, are

soriferous. The fronds have therefore, as it were, a double margin. In the less perfectly developed condition the membrane is reduced to a longitudinal vein-like ridge." This variety was found near Nettlecombe, in Somersetshire, by Mr. Elworthy, gardener to Sir W. C. Trevelyan, and subsequently near Selworthy, in the same county by Mrs. Archer Thompson. It has since been gathered in Sussex by Mr. Gray and Mr. Wollaston, and still more recently in the Isle of Wight, by Mr. R. Bloxam, [illegible] by the Rev. J. M. Chanter (several forms), and at Lands End, in Cornwall, by Mr. G. Dawson. A narrow form has been found near Brecon, by Mr. J. R. Colls. There is also a plant of this character, with multifid apices, in the possession of Mr. Wollaston, which was sold to him in 1849 by Potter, a well-known dealer (now dead), the history of which cannot be traced; from this the variety *proliferum* (25) has been raised, as well as plants [illegible]

25. *proliferum* (W.). This curious fern monstrosity as before stated, was raised from the spores of the multifid *marginatum* (24) in 1851, and the plants now in 1856, with the exception of those that have been grown in heat, are of the most pigmy dimensions, the largest not having attained three inches in length. The fronds in general outline are either small strap-shaped, truncate, calyciform, cornute, or subulate, but all with the exception of the last, are deeply and irregularly marginate, almost to the dividing of the frond in two. The excurrent membrane is the same as in the last described, but more developed in proportion, and the upper surface of the frond is irregularly verrucose. Hitherto there has never been any appearance of fructification, but in lieu thereof curious little bulbil-bearing cysts have appeared on the surface of the frond, proceeding generally from those parts where the spiracles or breathing tubes terminate. These form minute plants exactly the counterpart of the parents. This bulbil-making process Mr. Wollaston thinks is more or less common to all, when from some unknown cause the normal mode of propagation fails. This variety is becoming not uncommon.

28. *fimbriatum* (Lehm.). This unique variety is connected by easy steps with *bimarginatum* (27). It bears two sorts of fronds besides the usual hooks and points peculiar to this group. The first are about three-quarters of an inch in breadth, and from six to [illegible] the margins more or less frilled, twice crenato-lobate, and dilate; the sori rarely pass the excurrent membrane, which is the same as in other marginate forms. The second sort of frond is very narrow, about a quarter of an inch wide, and from nine inches to upwards of a foot in length, and more nearly resemble a winged rachis than a frond, the leafy part on either side being about the same width as the rachis itself, the margins are the same as the others, but more minutely divided, and the disrupted membrane recedes even to the rachis itself. It is a very neat and curious variety, and was found by Dr. Allman in Guernsey in 1849.

27. *bimarginatum* (W.). One of the most curious and rare varieties known. The fronds are linear strap-shaped, sometimes multifid, about a quarter of an inch wide, and nearly a foot long; some also are three quarters of an inch wide, and from six to [illegible] long. On the under side the excurrent membrane appears as in other marginate forms, but besides this, on the upper surface of the frond the cuticle is gathered and puckered up into cavities and nodules, and some of the lower venulets are most remarkable calyciform [illegible]. The stipes and lower part of the rachis are covered with hair-like scales. It seems a very tender variety, affected by the least frost, and very rarely perfects its spores. It was found near Rotherham, in Yorkshire, about five years ago, by Mr. H. Hayling, under gardener to the Rev. W. Hudson, of St. Catherine's, Regent's park, and was exhibited at the Horticultural Society's Rooms, in Regent-street, by Mr. R. Kennedy of Covent Garden.

28. *scaberum* (W.). The fronds of this variety resemble the wider fronds of *bimarginatum* (27), but are even much wider and longer, and the whole plant is of more vigorous growth. The face of the frond is more [illegible] and not quite so much drawn into cavities. The margins are [illegible] particularly towards the apex of the fronds. Unlike the other it is abundantly fertile. It was found in Ireland, in 1853, by Dr. Aiken, and is a singular and rare variety.

29. *constrictum* (M.). This curious form, has not been proved, but [illegible] remarkable as to [illegible] recording. The fronds are medium-sized, the upper half broad, and scarcely differing from the normal

state, the lower half equally contracted to less than half the width, deeply crenated and marginate, the extreme base being again broad so as to develope the usual cordate lobes, both sides being uniformly affected throughout, and strongly marginate in the contracted parts. Found by Mr J James in Guernsey.

30. *supralineatum* (M.) differs from the rest of the marginate group in having the excurrent membrane confined to the face or upper surface of the frond. There are several forms of this variety, some with out a small portion of each frond, others with one side only, and others with one or more fronds on a plant, affected. The most marked form (which was obtained from Epernay) has the whole plant affected more or less, and when perfect is a very beautiful object. The general outline of the frond is strap-shaped, sometimes but not often multifid, about eight inches long, the margins beautifully but irregularly corrugate till they meet the excurrent membrane, which forms a slightly sinuous line on each side of the rachis, reaching in a well marked frond from the apex to the base; the whole thus having the appearance of a narrow frond of the normal form superimposed on the variety *crispum*. It was first brought into notice in this country by Mr S. F. Gray, and analogous forms have subsequently been found in Surrey by Dr Allchin, in Yorkshire by Mr A. Clapham, in the Isle of Wight by Mr R. Bloxam, in Devonshire by the Rev. J. M. Charter, in Guernsey by Mr C. Jackson, and in Hampshire and Sussex by the Rev. W. H. Hawker and Mr G. B. Wollaston. It is a rare variety.

31. *multiforme* (W.). This most remarkable and compound form, embraces within itself the peculiarities of nearly every known form of variation. Its fronds are multifid, ramose, cornute, subulate, either simple or multifid, marginate, supralineate corrugate, laciniate, or depauperate, and cannot be better described than by a reference to the varieties so treated by the above epithets. It was found in Guernsey by Dr Allchin in 1849, and is a permanent form, and not now very uncommon.

32. *areolatum* (M.). The type of a rather class of variation, in which the upper surface is developed into ridges or raised points. In this the fronds are normal in outline, coriaceous, the margin here and there lobed, or slightly sinuous, but the tissue is sunk between the veins producing evident furrows, and the veins themselves bear two or three elevated points, these points being scattered rather plentifully over the whole frond. It was found in Guernsey, and sent to us by Mr J. James of Vauvert.

33. *jugosum* (M.). Also found in Guernsey, and communicated by Mr James and Mr C. Jackson. Two or three modifications have been met with. Its peculiarity consists in a thickening of the veins which bear sori, resulting in the production of a series of ridges or leafy sorus-like excrescences on the upper surface, and opposite to the sori on the lower surface, producing a curious warty appearance.

34. *papillosum* (M.). This curious variety developes a series of distinct wart-like excrescences side by side, above, on the veins, near their apices, and forming a border to the upper surface of the fronds, which latter in the specimens we have seen are small, and rather narrow, but of normal outline. It was sent from Guernsey by Mr C. Jackson.

35. *rugosum* (Allchin). This variety is marginate at the apex, the leafy portion of the frond is very short in comparison with the stipes, it is undulate, crenate, and on the rachis almost echinate, and at the apex has a curious irregularly-shaped pocket or pouch, formed by the splitting of the epidermis. This pouch is fertile, as well as other portions of the frond, and has the rachis generally in its under cuticle. The stipes is very long and thinly clothed with scales. It was found in Ireland by Dr Allchin in 1853 and is a permanent and exceedingly rare form.

36. *undicaule* (Allchin). This resembles *rugosum* (35) in many respects, but the fronds are more variable in form and less rugose, some being pocketed, some simple, and others multifid. But the great permanency of this form is the almost total absence of scales—so unusual in *Scolopendrium*. This is so conspicuous in its variation that the convolutions of the fronds, which are to be developed for several years to come, are visible on the crown. This also was found by Dr Allchin in Ireland, and is very rare.

37. *peraferum* (W.). This is akin to *rugosum* (35) and *undicaule* (36), in having a pouch-bearing apex, but has a scaly stipes, and the fronds are undulate and irregular when in character but they are

occasionally normal. The pocket is fertile. This is likewise of Irish origin; it was found by Dr. Allchin in 1853, and has continued constant.

38. *abruptum* (W.). The peculiarity of this variety consists in the midvein or rachis rarely reaching to the apex of the frond, which is blunt and rounded. It also occasionally divides at the summit. In other respects it is normal. It was found in Sussex by Mr. Wollaston in 1854, and is only a subpermanent variety, some of its fronds resembling those of the next variety.

39. *variabile* (W.). This as its name implies has fronds of various shapes and sizes. It is a vigorous cosmopolitan form, and constant under cultivation. The fronds are either normal, branched, reniform, or bi-reniform, abrupt, and often partially or wholly unite two forms on one stipes. It is abundantly fertile, and has been found in Guernsey by Dr. Allchin and Mr. C. Jackson. Another closely allied form, which Mr. Wollaston calls *bireniforme*, connects this with the last. In this the stipes generally bears two kidney-shaped lobes; sometimes the fronds are only forked, the divisions crossing at the apex; occasionally they are branched, each branch bearing its reniform lobe or lobes. It has been found in Guernsey, Devonshire, and the Isle of Wight, but can hardly be considered permanent. In some plants found by Mr. C. Carter many of the fronds consisted of two reniform lobes standing so as to give the form of a goblet.

40. *polymorphum* (W.) is certainly only a modification of the same variety, but too unlike it to be left in nothing. It was found in Sussex by Mr. Wollaston in 1854. The fronds are remarkable for their great breadth compared with their length. They are either normal, multifid, ramose, truncate, or show one or more of these characters combined. Other fronds have a peculiar excrescence on their margin, as if the old fronds were attempting to throw out new ones. It is fertile, constant, and rare.

41. *apicilobum* (M.). A distinct and marked form, with fronds about three inches long and two broad, widest upwards, the midvein not extending to the end, which is blunt and rounded in outline, and deeply cut into several obovate lobes. It was found in Guernsey by Mr. J. James.

42. *striatum* (M.). Another of Mr. James's discoveries in Guernsey. The fronds are obliquely streaked with yellowish green on a dark green, giving them a distinct variegation. Another variegated form found in Guernsey by Mr. Jackson, which is streaked with yellowish white, is not constant.

43. *viviparum* (W.) is one of the most remarkable instances of viviparous growth amongst our British Ferns. The plant has never yet attained any other than the most pigmy size, and is covered with bulbilla both on the frond and stipes. The fronds are most irregular in shape, but chiefly lacinate. It is a perfectly constant form, and was found in Clare, Ireland, by Dr. Allchin in 1853.

44. *spirale* (M.). This was found in Guernsey by Mr. James. The fronds are short, two or three inches long, narrow in proportion, undulate, and twisted in a spiral or corkscrew fashion. It promises to be a constant form, several successions of fronds having maintained the same character.

45. *crispatum* (M.). A small and very much curled undulately-crisped variety, tapering from the broadish base to an attenuated point, which narrowing of the points gives it an aspect different from the usual forms of *crispum*. It was found by Mr. James in Guernsey, and is very scarce and beautiful.

46. *crispum* (Willd.). This beautiful variety differs from all others in being uniformly barren. It is one of the oldest forms known, and is most justly admired for the elegant frilling of the frond. It attains the full size of the species, and is exquisitely and symmetrically waved or corrugate, and its margin crenate. The basal lobes are unusually developed, and overlay each other to a great extent. It has been found recently in Yorkshire by Mr. A. Clapham, in Hants by the Rev. W. H. Hawker, in Denbighshire by Mr. Pritchard, and in Guernsey by Mr. C. Jackson.

47. *subvariegatum* (W.). The fronds of this form are almost always divided at the point, and faintly streaked with white, giving them a mealy appearance. This whiteness seems owing to the disruption of the cuticle from the tissue beneath. The fronds are extremely various in shape, being ramose, or multifid, or both, irregular, undulate, crenate, lacinate, generally slightly auricled, but sometimes, as in *sagittifolium*, producing a barbed auricle, and they are profusely [illegible]. They are also very

prone to send out a midsummer shoot, which is common to all Ferns in a slight degree, but this occasionally produces a young stipitate frond from the apex of the large one, its stipes being thickly clothed with scales as in the lower or parental portion. It was found by Mr Wollaston in Dorsetshire.

48. *undulatum* (M.). This is regularly wavy-curled like *crispum* (46), but somewhat less so, and is narrower, and unlike that, fertile. A lobed variation of it, an old garden plant—*undulato-lobatum*—has been recently found in Sussex by Mr Wollaston. The typical state of this variety is often confounded with *crispum*, and is a constant plant, not uncommon.

49. *complicatum* (W.) was found wild in 1853 in private grounds at Chislehurst, Kent, by Mr Wollaston. The fronds are either simple or multifid, and their margins are irregularly crenate, lacinate, and undulate; in some respects it approaches *undulatum*. It is an unusual form.

50. *conjunctum* (M.). A very pretty form found by Mr James in Guernsey. It is dwarf, broad undulated, lobed, and the apices of the lobes are multifid, with the points twisted as in *crista-galli* (58).

51. *sagittifolium* (W.) is remarkable for having the auricled portion of the lower part of the frond elongated and deflexed, as the barbs of an arrow, each with a distinct midrib. The plant has a tendency to be multifid both at the apex of the frond and also at the elongated auricles. It was found in Sussex by Mr Wollaston in 1854 and is doubtless a constant form as the fronds of the former year had the same peculiarity. Others very similar have been found in Ireland by Dr. Allchin, in 1853, in the counties Clare and Kerry. It is not the var. *sagittatum* of Willdenow a dwarf South of Europe plant.

52. *retiforme* (M.). The netted venation is the chief peculiarity of this variety. The fronds are unevenly strap-shaped, sub-multifid, and blotched with whitish-green almost amounting to variegation. The margin is entire but uneven. It was found in Ireland by Dr Allchin in 1853, and is unique.

53. *dissimile* (W.) was found by Mr A. Clapham near Settle, in Yorkshire, in 1855, and, as its name implies, has the fronds so unlike each other that they seem to belong to different plants; some are multifid, sinuate; others interrupted and lacinate, and some again truncate, obtuse, fan-shaped. It is a vigorous growing form.

54. *depauperatum* (W.). A most curious deformity. Instead of fronds, the plant has little else but their midribs, forming subulate points, either simple, bifid or multifid. And as if instinct were given it, and that it felt it could not exist without spiracles, it throws up, in the course of the season, one or two large digitate fronds. It is a seedling from *digitatum* (65) raised by Mr Wollaston in 1851.

55. *multifidum* (W.) includes all forms from the simply divided apex of the *lobatum* of authors to those which are more complicated, but in which the lower portion of the frond is normal, and which are neither uniformly affected, nor uniformly permanent. The sub-forms are numerous.

56. *furcatum* (W.). A very rare variety. Its character consists in the apex of the frond splitting exactly down the midvein, each portion falling back, forming the shape of a bird's claw, these occasionally grow on as in other multifid forms, and divide exactly in the same way over and over again, while the lower portion continues normal.

57. *crustatum* (Clapham) is closely allied to *crista-galli* (58) and also to *ramosum* (63)—to the former, in the plication of the apex, although it is not nearly so much crisped, and to the latter in general habit and constancy. It also has a curious inclination to produce frilled cups on the under side of the frond on the main rachis, an inch or two from the apex. The frond is normal in its lower parts. It was found by A. Clapham, Esq., near Settle, in Yorkshire, and is rare.

58. *crista-galli* (W.) is one of the modifications of *multifidum*, but differs from it in the apex being a complicated feeding rather than a complicated dividing of its parts. The lower portion of the frond is crenato-undulate. It is permanent under cultivation, and produces the same form from its spores. It was found in Dorsetshire in 1850 by Mr Wollaston.

59. *cheilanthoides* (W.). This curious little plant, evidently of the multifid group, is, from its pigmy habit, scarcely to be distinguished as such. The fronds rarely attain a length of four inches, but are more frequently from half an inch to two inches long, the apex of most of them is bifurcate, exactly in

the shape of a crab's-claw having the external margin smooth and the internal crenate or dentate. It was found at Chislehurst, Kent, by Mr. Wollaston, in 1854.

60. *rigidum* (W.). In this variety the apex of the frond is multifid as in *cristatum* (57), the lower portion being normal. The fronds are borne either on a single or ramose stipes, and this stipes so rigid or wiry that it is quite a remarkable feature in the plant. It has a slight tendency also, to be supra-lineate. Mr. Wollaston found it in Sussex in 1854.

61. *laceratum* (M.). This is, perhaps, the most remarkable variety yet known; instead of being simply strap-shaped, the fronds may be not inaptly called sub-pinnatifid. "It is short and broad, sub-deltoid, the margin deeply inciso-lobate, the lobes large, crowded, and multifid crisped at their apex; or sometimes strap-shaped, the margin inciso-lobate, with the lobes narrow, elongate, and tapering to a point; the apex sub-multifid, the base sometimes hastate." It was first found at Taunton, Somersetshire, by Mr. J. Young, who has raised from it many seedlings, bearing more or less the characters of the original. One very similar form has lately been found in Yorkshire, by Mr. Clapham, of Scarborough. It is now a common garden variety, and is sometimes known under the names of *palmatum*, *serratum*, and *endiviæfolium*.

62. *glomeratum* (M.). There is no plane or strap-shaped portion to the frond of this variety, but it divides over and over again in so dense a manner, that a frond of about three inches high forms almost a perfectly globular mass. It was found in Jersey by M. Picquet, and was sent to us by Mr. Jackson.

63. *ramosum* (Willd.). This, with the variety *digitatum* (65) and *glomeratum* (62), are the most ramose of all the forms of *Scolopendrium*. It is ramified at the apex at least two hundred fold, in some instances. Each frond consists in a multiplication of all its parts, the stipes starting singly from the caudex, ramifying as the limbs of a tree, and each branch bearing a densely and multifidly crisped frond and frondlets almost *ad infinitum*. Its early history is not known, but is mentioned as long ago as Plukenet's time. Recently good examples have been found by Mr. C. Jackson in Guernsey, and by the Rev. J. M. Charter in Devonshire. It is uniformly constant and reproduces itself by its spores.

64. *ramosum majus* (Clapham). This is quite unlike *ramosum*, being less multifid. Mr. Clapham says that "the peculiarity it possesses is the great thickness of the stipes, which seems to be a combination of two or three run into one, so that several fronds branch out from the summit of the stipes. The fronds in their outlines and cutting vary much." "It originated in the Camellia house of Mr. Clapham, of Settle, Yorkshire, where it accidentally came up in the soil." It is quite constant. In specimens sent by Mr. Clapham, two or three vigorous, almost normal fronds, grew on one stipes.

65. *digitatum* (W.). This variety resembles *ramosum* (63), except that its fronds are flat, that is, all its ramifications and divisions are in one plane, so that the fronds are somewhat hand-shaped. The wonderfully compound ramifications of this variety is shown below, only approximately, however, in the fifth, sixth, and seventh series of divisions. It is by no means a common form. The frond from which this table was drawn up, was grown by Mr. Wollaston, and with the living plant, is now in his possession.

1st series,	1	Stipites	3rd series,	[illegible]	Rachides	6th series,	891 Veins
2nd "	3		4th "	25		7th "	2675 Apicul[illegible]
			5th "	90			

66. *lacerum* (Sim). This variety is a modification of the last, from which it was raised, but is permanently unlike it. It has a tendency to be viviparous. The fronds are branched as in *digitatum*, but the leafy portions are much depauperated, and frequently little else than the veins remain, giving the appearance of a leaf lacerated or torn into shreds, with the irregularly-jagged margins shrivelled. It was raised from spores by Mr. R. Sim, of Foot's Cray, Kent, and is rare.

PLATE XLIII. A

THE SCALE FERN, OR SCALY SPLEENWORT
(CETERACH OFFICINARUM).

CETERACH, *Willdenow.*

Clusters of Spore-cases oblong or linear oblique, borne on the anterior side of the venules except the lowest which is posterior, at first hidden amongst densely imbricated chaffy scales. *Indusium* obsolete. *Veins* forked or pinnate, *venules* anastomosing near the margin, the lowest posterior one sometimes on the side next the rachis, the ultimate *venules* free.

C. OFFICINARUM, fronds coriaceous, narrow lanceolate, sinuato-pinnatifid, often pinnate below, segments oblong obtuse, entire or slightly crenated.

CETERACH OFFICINARUM, *Willdenow, Enumeratio*, 1068. *Species Plantarum*, v. 136. *Hooker, Genera Filicum*, [illegible] *Hooker and Arnott, British Flora*, 566. *Babington, Manual of British Botany*, [illegible] *Deakin, Florigraphia Britannica*, iv. [illegible] *Newman, History of British Ferns*, 2 ed. [illegible] *Moore, Handbook of British Ferns*, [illegible] *Sowerby, Ferns*, 62, t. 16. *Fée, Genera Filicum*, 206, t. [illegible] *Gray, British Plants*, [illegible]

ASPLENIUM CETERACH, *Linnæus, Species Plantarum*, 1538. *Bolton, Filices Britannicæ*, [illegible] t. 12 [illegible]

ASPLENIUM SINUATUM, *Salisbury, Prodromus*, [illegible]

SCOLOPENDRIUM CETERACH, *Symons, Synopsis Plantarum*, 193. *Smith, English Botany*, xviii. t. [illegible] *English Flora*, iv. 302. *Roth, Flora Germanica*, iii. 48.

[illegible] CETERACH, *Bernhardi* [illegible] *der Asplenium*. Act. Erford. 1802, [illegible]

[illegible] CETERACH, *Bernhardi*, *Schrader's neues Journal für die Botanik*, 1806, part 2, 22.

GRAMMITIS CETERACH, *Swartz, Synopsis Filicum*, [illegible] *Schkuhr, Kryptogamische Gewächse*, 156, t. 7. [illegible] *Mackay, Flora Hibernica*, 337.

GYMNOGRAMMA CETERACH, *Sprengel, Systema Vegetabilium*, iv. 38 (excl. syn. [illegible]). *Presl, Tentamen Pteridographiæ*, 219, t. 9, f. [illegible] 10 [illegible]

BLECHNUM SQUAMOSUM, *Stokes, Botanical Materia Medica*, [illegible] 617.

[illegible] CETERACH, *Newman, History of British Ferns*, 2 ed. [illegible] 3 ed. 277. *Appendix to Phytologist*, [illegible]

EXPLANATION OF THE PLATE.

PLATE X[illegible] A. CETERACH OFFICINARUM. 1, from Bath, Somersetshire, *Rev. E. Bosanquet*. 2, from North Lancashire, *Miss S. Beever*. 3, CETERACH OFFICINARUM, [illegible] from [illegible] *Dr.* [illegible] 4, the same [illegible] from [illegible] *J. R. Cole*.

HABITAT. Growing on walls and rocks, less frequently on calcareous rocks, rarely epiphytal, this Fern is generally dispersed over England and Wales, though less frequent on the eastern side. It is abundant in Ireland, and occurs at rare in Scotland, occurring however in the Lowlands, in Perthshire, in Argyleshire, and [illegible], but appears to be absent from the north [illegible] of Orkney and Shetland, also from the [illegible] Islands [illegible] is found in Jersey [illegible] its altitudinal range is computed to extend from the sea-level to an elevation of about 800 feet. In Ireland, Dr. [illegible] found it [illegible] on granite rocks [illegible] on the [illegible]

GEOGRAPHICAL DISTRIBUTION. We do not find that the Scale Fern extends further north than Scotland, but it occurs throughout the centre and south of Europe, as France, Switzerland, Italy, Germany, Spain, Portugal, Greece, &c. In Asia, it is found on the Siberian side of the [illegible] Mountains, in the Caucasus and Taurus, at Erzeroum, and in North-West India, Kashmir and Afghanistan (*Sir W. Hooker*). It is found in Algeria and in Madeira, the Azores and the Cape de Verd Islands. [illegible] in Brazil. The [illegible] of [illegible] *Ceterach canariensis* of Willdenow, a plant much larger in all its parts than even the larger forms of our English plant, is probably distinct as a species [illegible] specimens of this [illegible] we have seen [illegible] appeared to be a true distinction.

Caudex short, tufted, scaly. *Scales* ovate-lanceolate, finely reticulato-venose, dark brown. *Fibres* branched, numerous.

Stipes short, from a half or inch to three inches long, terminal and adherent to the caudex, thick, contracted at the base, furnished with numerous ovate-lanceolate peltately attached scales, of a pale tawny colour, beautifully venose with close dark reticulations.

Vernation circinate.

Fronds numerous, from an inch and a half to six or eight inches long, coriaceous, deep green and smooth above, densely clothed beneath with ovate-acuminate, slightly [illegible] tawny reticulately [illegible]

closely-imbricated scales. Linear-lanceolate, deeply pinnatifid, often pinnate below. *Lobes* oblong obtuse, sessile and adnate by their whole base when distinct, more usually dilated on both sides and connected at the base, margined with projecting scales of the under surface.

Venation indistinct from the thick texture of the frond, consisting of a sinuous midvein, entering the lobe from near the lower angle, and giving off close to the base on its anterior side a vein which is several times forked; the rest of the veins are alternate and two or three times forked. Beyond the second fork the branches or venules anastomose and form two or three series of small areoles near the margin; [illegible] being sometimes free, sometimes [illegible].

Fructification produced over the whole under surface. *Sori* linear oblong, borne on the anterior side of the anterior venules, above the first fork, except in the case of the lowest anterior vein, which is frequently bisoriferous, one sorus being as usual on the anterior side of its anterior venule, the other on the posterior side of its posterior venule; they are at first hidden by the dense covering of scales, which eventually they burst through. *Indusium* obsolete; described as an erect white membranous ridge. *Spore-cases* roundish obovate. *Spores* roundish or somewhat oblong, muricate.

Duration. The caudex is perennial. The fronds are persistent, new ones appearing about May.

Among British Ferns this plant is at once recognised by its tufted sinuato-pinnatifid fronds, invested with a close covering of tawny scales beneath. The correct generic position of the plant is not so satisfactorily or readily settled, neither the degree of relationship it bears to a larger though closely analogous plant found in Teneriffe and the Canaries. Its sori are said to have a narrow indusium behind them, and the spore-cases grow from the anterior side of the vein, and hence it has been, and probably correctly, considered to belong to the *Aspleniaeae*, with which the reticulation of its scales is in accordance. We have never found in the British plant, though we believe we have in that of the Canary Isles, an undoubted indusium, but the dense clothing of scales seems a sufficient explanation of the obsolete condition of this organ, which is probably represented by a raised line or ridge which occurs behind the line of spore-cases. As to the distinctness of the Canary Island plant it must be admitted that it presents only differences of degree, but it is not unfrequently twice the length and three times the breadth of the largest specimen of true *C. officinarum*, and even its smaller examples of the same length as large English fronds are twice their breadth, and consequently of a different outline. If a variety only, it is a gigantic one.

It grows with tolerable freedom in rough porous soil, which should consist of sandy loam, and should contain a considerable amount of fragments of limestone or old mortar; and it must be kept rather dry than otherwise, and in a well-aired place. Some of our correspondents recommend the use of old cow-manure, and altogether more liberal treatment, but in that case more than ordinary caution is necessary not to overwater it.

This species does not vary much except in size. There are, however, one or two forms found in some situations, which may be considered as slight varieties, namely:

1. *crenatum* (M.). This has the margins of the lobes distinctly crenato-sinuate, and is usually larger than the common form. It is met with occasionally in various localities, occurring probably under certain conditions which favour luxuriant growth, and hence not constant when indifferently cultivated.

2. *multifidum* (W.) is a non-permanent unfrequent form, differing from the normal only in the divided apex of the frond.

3. *depauperatum* (W.). Of this several variations have been met with, chiefly in Ireland, where it was found by Dr. Allchin. The most remarkable of the forms was found by Lieut.-Col. Buchanan at Kilkenny. The fronds are irregularly sinuato-pinnatifid, some bifurcate at the apex, some tapering to an acuminate point, and others cornute; the segments very much depauperated, occasionally almost wanting, in which case the fronds present the appearance of a sinuately winged rachis. It is probably constant, and is now cultivated by Mr. Wollaston.

A. Ceterach officinarum.

B. Gymnogramma leptophylla. C. Blechnum Spicant.

PLATE XLIII. B

THE SMALL-LEAVED GYMNOGRAM

(GYMNOGRAMMA LEPTOPHYLLA).

GYMNOGRAMMA, *Desvaux.*

Clusters of Spore-cases without covers, forming elongated forked lines on the back of the veins [illegible] superficial, often becoming at length effuse and confluent. *Veins* distinct [illegible] their extremities, forked or pinnate.

G. LEPTOPHYLLA: fronds oblong-ovate, bi-tripinnate, glabrous, fragile; pinnules or pinnulets ovate-cuneate, usually three-lobed, the lobes dentate and laciniate.

GYMNOGRAMMA LEPTOPHYLLA, *Desvaux, Journal de Botanique,* [illegible] *Berlin Magazine* v. [illegible] *Moore, Handbook of British Ferns* [illegible] *Newman, History of British Ferns* [illegible] *Sprengel, Systema vegetabilium,* [illegible] *Presl, Tentamen Pteridographiae,* 210. *Hooker fil., Flora of New Zealand,* ii. [illegible] *Hooker and Greville, Icones Filicum,* [illegible]

GYMNOGRAMMA [illegible] *Colenso* [illegible] *Hooker.*

GYMNOGRAMMA [illegible] *Tasmanian Philosophical Journal* fide Hooker, [illegible]

[illegible] *Species Plantarum,* [illegible]

[illegible] *De Candolle, Flore Française,* [illegible]

[illegible] *Swartz, Synopsis Filicum* [illegible] *Willdenow, Species Plantarum,* [illegible]

[illegible] *Link, Filicum Species,* [illegible] *Genera Filicum,* [illegible]

[illegible] *Annales des Sciences Naturelles,* v. 18, [illegible]

[illegible] *Kaulfuss, Enumeratio Filicum,* [illegible] *Species,* [illegible]

[illegible] *Lamarck, Encyclopédie Botanique,* [illegible]

[illegible] *Newman, History of British Ferns,* 13.

EXPLANATION OF THE PLATE

PLATE XLIII. B. GYMNOGRAMMA LEPTOPHYLLA: [illegible] *B. Ward* [illegible] cultivated [illegible] *Jackson* [illegible] from [illegible] *F. Parsons.*

HABITAT. The habitat which brings the Small-leaved Gymnogram into our list of [illegible] that of Jersey [illegible] rather political than geographical [illegible] It first [illegible] several [illegible] localities [illegible] St. Lawrence, St. [illegible] and St. [illegible] Mr. Ward, [illegible] in [illegible] *Phytologist* [illegible] found [illegible] Rosemary [illegible] seems too far north for a [illegible] Fern [illegible] accidental [illegible]

GEOGRAPHICAL DISTRIBUTION. This delicate species is remarkable [illegible] In Europe it ranges from Jersey, France, and Switzerland [illegible] Germany, extending to Spain, Portugal [illegible] Greece [illegible] In Africa it occurs in Algeria, Madeira [illegible] Cape of Good Hope [illegible] *Hooker* [illegible] America [illegible] In Australia [illegible] Victoria and the Swan River, and in Tasmania and New Zealand. *Sir W. Hooker.*

Caudex small, subglobose, with a few scattered fine [illegible] in the younger stages. *Fibres* few, brown [illegible]

Stipes as long as or sometimes longer than the fronds, smooth and shining, dark chestnut-brown, paler upwards, rather stout in the most perfect fronds, terminal, and adherent to the caudex.

Vernation circinate.

Fronds about six or eight inches [illegible] variable in size and form, delicate, membranaceous, fragile, pale yellowish green, very slightly hairy when young, quite smooth afterwards. The first frond developed from the prothallus or [illegible] form [illegible] small, about half an inch long, fla[illegible] form, three [illegible] segments again dichotomously lobed, the lobules [illegible] The next frond acquires an oblong-ovate outline, and the [illegible] are so far separated as to form three pinnae, which

r- ovided on the same dichotomous plan as the former In one such example now before us, which is five-e ghs of an inch long, the pinnæ are each twice dichotomously lobed, and each ultimate division has its sides nearly parallel, and its apex blunt and two-cleft. Two or three fronds of this pinnate character each successive one larger and more divided than the preceding, and all broader and more leafy in character than the subsequent ones, are produced during the adolescent state of the plants After this stage has been passed, the fronds assume their mature form become more compoundly divided, and in two, three, or four stages, according to the vigour of the individual plant, reach to their full development. The intermediate fronds are from one-and-a-half inch to three inches high, and are distinctly bipinnate, and generally fertile. The fully developed fronds are from three to six or eight inches high, and grow erect. These mature fronds are oblong ovate, bi- or tri-pinnate, and fertile throughout. *Pinnæ* ovate triangular alternate. *Pinnules* ovate-cuneate, about three-lobed, the lobes obovate, and notched at the apex. The pinnules are scarcely stalked, their base tapering down to a narrow and slightly decurrent attachment. Specimens of vigorous growth become tripinnate, by the more complete separation of the lobes of the pinnules.

Venation of the ordinary pinnules consisting of a vein which forms by dichotomy a branch at the base of each lobe this vein becomes again branched in the same dichotomous manner near the centre of the lobe, its two venules being directed, one towards each of the two apical teeth, and terminating within the margin. Occasionally the lobe is not toothed, and the vein is simple

Fructification occupying the whole back of the frond, without indusia. *Sori* linear, forked, occupying nearly the entire length of the venules, and a portion of the vein below the dichotomy, hence forked that is, diverging in two lines from near the base of the pinnæ along the narrow lobes nearly to their apex, at first distinct, but eventually becoming confluent into one mass. When the vein is simple the sorus is simply linear *Spore-cases* nearly globose. *Spores* reniform or bluntly triangular faintly striate-punctate, dark brown-purple

Duration. The rhizome is annual, and the development of the plant consequently rapid. In Jersey we learn that the prothallus is developed in the damp late autumnal months, being perfectly formed in November By January three or four fronds have been produced, in April or May the growth is mature, by August the plants have perished. Sometimes in cultivation the fronds are not produced till the second year

This Fern clearly belongs to the genus *Gymnogramma*, which is distinguished from *Grammitis* by the greater length, and the more or less frequently forked condition of the sori. This group, itself not too distinct however from *Grammitis*, some modern botanists have desired to divide into several genera, one of which, *Anogramma*, was proposed expressly for this species by Link Beyond the marks of habit and aspect, however, there is nothing to separate generically any of the free-veined *Gymnogrammas* and such marks alone are insufficient

No other British Fern approaches at all nearly to the Small-leaved Gymnogram, either in aspect, or in botanical characters

It succeeds with very little care from the cultivator, and like its West Indian ally, *Gymnogramma chærophylla*, scatters its spores, and becomes, as it were, a weed, in congenial situations. Any light sandy soil suits it. That in which it grows naturally in Jersey, and of which Mr Ward kindly gave us a portion richly furnished with its spores, is a sandy loam, and scattered on the surface of a flower-pot has yielded an abundant crop of plants. The young plants like shade, moisture, and a temperate climate, which conditions will ensure their successful growth. Propagation must either be trusted to the natural scattering of the spores, or a frond or two just arrived at maturity should be preserved and the spores deposited towards autumn in the situations where plants are required. We learn from several cultivators who have grown the plant in cold situations, that the development has not gone beyond the production of the prothallus until the second year Our plants have been strictly annual.

PLATE XLIII. c

THE COMMON HARD FERN (BLECHNUM SPICANT).

BLECHNUM, *Linnæus*.

Clusters of Spore-cases forming a continuous narrow line on the inner side of a series of transverse [illegible], near to and parallel with the midrib [illegible] with a [illegible] covering. *Indusium* continuous, opening on the inner side. *Veins* forked from a central [illegible], *venules* [illegible] to their apices in the barren fronds, and [illegible] transverse or longitudinal receptacle in the fertile.

B. SPICANT: fronds dissimilar, linear-lanceolate, the barren prostrate, pectinato-pinnatifid, [illegible] below, with oblong linear flat lobes; the fertile erect, taller, [illegible] with linear [illegible] lobes, having reflexed margins.

[illegible] Smith, [illegible] Sciences de Turin, [illegible] Flora Botanica [illegible] Moore, Handbook of British Ferns, 185 [illegible] British Ferns. [illegible]
BLECHNUM [illegible] Smith [illegible] English Botany [illegible] English Flora [illegible] British Plants [illegible] Flora [illegible] 343 [illegible] British Flora [illegible] Manual of British Botany [illegible] Ferns [illegible] 110 [illegible] Species Plantarum [illegible]
OSMUNDA SPICANT, Linnæus, Species Plantarum, 522. [illegible] Flora Britannica [illegible]
OSMUNDA BOREALIS, Salisbury, [illegible]
ONOCLEA SPICANT, Hoffmann, [illegible]
ASPLENIUM SPICANT, Bernhardi, [illegible] Journal für die Botanik, 1801, [illegible]
STRUTHIOPTERIS SPICANT, Weiss, Plantæ Cryptogamicæ, 287; Scopoli, Flora [illegible] 288.
[illegible] SPICANT, [illegible] Histoire des Plantes de Dauphiné [illegible]
[illegible] BOREALE, [illegible] Flore Française [illegible]
LOMARIA SPICANT, Desvaux, Berlin Magazine [illegible] Species [illegible] Pteridographia, 12. [illegible] Pteridographia Britannica [illegible]
LOMARIA [illegible] Hortus Regius Berolinensis [illegible]
STEGANIA [illegible] R. Brown, Prodromus Floræ Novæ Hollandiæ [illegible]
SPICANTA [illegible] Presl, Epimeliæ Botanicæ. [illegible]

Var. **RAMOSUM**: fronds divided, the apices of the divisions densely multifid-crisped, forming a dense convex tuft of segments.

BLECHNUM SPICANT var. RAMOSUM, [illegible] Phytologist [illegible] Moore, Handbook of British Ferns, [illegible] 188.

Var. **MULTIFURCATUM**: fronds divided, the apices of the divisions repeatedly forked, the ultimate divisions [illegible] prolonged, and forming a flat spreading tuft of segments.

EXPLANATION OF THE PLATE

PLATE XLIII. c.—BLECHNUM SPICANT. 1. from Exeter, Devonshire, *R. J. Gray*. 2. B. SPICANT [illegible], from Tunbridge Wells, Kent (cultivated), *G. B. Wollaston*. 3. B. SPICANT MULTIFURCATUM, var. from Penryn, Cornwall, *F. Symons*.

HABITAT.—The *Blechnum* is one of our commonest Ferns, distributed all over the United Kingdom, [illegible] Northern and Western Isles to the south of England, and from the east coast of England [illegible] west of Ireland [illegible] the Channel Isles. It ranges from the sea-level to an elevation of [illegible] feet above the sea, being, [illegible] Mr. Watson remarks, taking horizontal and vertical range into account, probably the most widely distributed of all our Ferns. [illegible] grows in heathy and stony places, preferring moisture and [illegible] Ferns which thrive as well in exposed situations [illegible]

GEOGRAPHICAL DISTRIBUTION.—This Fern is distributed over Europe, extending from Sweden in the north [illegible] Spanish peninsula and to Sicily and [illegible]. It occurs also in the Caucasian provinces of Russia in Asia, and is found in Kamtschatka and at Sitka. In Africa it is found in the [illegible] Madeira, the Canaries, and Teneriffe, and at the Cape of Good Hope. A Brazilian plant, the *Lomaria Sellowiana* of Presl, is very closely related, perhaps the same, [illegible] also [illegible] found in Chili.

Caudex stoutish, tufted, erect or decumbent, scaly. *Scales* narrow lanceolate acuminate, deep tawny brown. *Fibres* stout, numerous, branched, the younger parts densely tomentose.

Stipes of the barren fronds usually short, [illegible] one or two inches long, but sometimes four or five inches, densely scaly at the base, and with a few narrow scattered scales upwards, dark purplish

crown terminal and adherent to the caudex, and as well as the rachis, granulate in front, rounded and prominent behind. The fertile fronds have a longer dark-coloured stipes, of from five to ten inches long, and the rachis is more distinctly purple.

Venation curved.

Fronds (the barren ones) averaging about a foot, but varying from six to eighteen inches in length, under two inches in breadth, dark green, spreading or prostrate, linear lanceolate, pectinately pinnatifid. *Lobes* linear oblong, flat, somewhat falcately curved in an upward direction, diminishing below; the lower ones small, roundish, the upper continent into a lanceolate point, dilated and contiguous at their base, bluntish or acute at their apex, the margins entire, or rarely, when very vigorous, obscurely lobed. *Fertile fronds* of the same form, taller—one to two feet high—erect, pinnate below, growing from the centre of the crown. *Pinnæ* and *segments* linear acute, contracted to about half the width of the barren segments, the lower ones distant, the upper more contiguous, and then dilated and confluent at the base. Intermediate fronds, sparingly fertile and not contracted, are sometimes produced.

Venation of the barren fronds distinct, that of the lobes consisting of a stout midvein, producing once or twice forked *veins*, the *veinlets* terminating within the margin in a small transparent oval-shaped head. The venation of the fertile fronds is altered in consequence of their contracted nature, and consists of a series of veins, seldom having space to become forked, but becoming lost in the continuous longitudinal sporangiferous receptacle which runs parallel with and very near to the midvein. In the less contracted fertile fronds, the veinlets are continued towards the margin exterior to the receptacle.

Fructification on the back of the fertile fronds and occupying nearly the whole under surface. *Sori* indusiate, linear, extending on each side the midrib, the whole length of the narrow pinnæ, over which they soon become confluent. *Receptacle* continuous, longitudinal. *Indusium* a narrow linear scarious membrane attached along the exterior side of the receptacle, within the margin of the frond, but sometimes from the excessive contraction of the pinnæ almost marginal. *Spore-cases* nearly globose. *Spores* roundish oblong or ovate, slightly angular and punctate.

Duration. The caudex is perennial, the plant is evergreen, the old fronds continuing through winter, and young ones springing up about May.

This is a very elegant and distinct-looking Fern, and on that account, no less than for its evergreen character, it deserves to be more frequently cultivated. Its long narrow pectinately divided fronds, the barren and fertile growing separate, afford easy marks of recognition.

There exists a difference of opinion among botanists as to the generic position of this plant, some referring it to *Lomaria*, while others retain it in *Blechnum*. The differences between these genera are merely those of degree, both having continuous longitudinal sori, these in *Lomaria* are marginal, and in *Blechnum* are placed near the midvein. In this instance, the contraction of the frond brings the otherwise costal sorus very near to the margin, but as there is usually and often very distinctly, a space exterior to it, the plant seems to accord best with the structure of *Blechnum*, in which we continue to place it, notwithstanding the *Lomaria*-like contraction of the fertile fronds.

In cultivation it prefers a northern exposure, abundant moisture, and a somewhat retentive soil. It is a very ornamental plant for rockwork where these conditions can be fulfilled, but does not so well as others bear the confinement of pot or house culture. It is increased by division. In transplanting, the roots should be carefully preserved, with a good mass of soil.

There are many forms aberrant from the type of the species, these are enumerated below, chiefly in Mr. Wollaston's notes:—

1 *lanceolatum* (W.). This is the least divided form of the species, bearing much resemblance to *Lomaria Patersoni*, and is perhaps the most striking of all the varieties. It is as if the plant was in process of formation. Generally the fronds are entire and strap-shaped, from the apex downwards for one-third or even half their length, while the remainder is obtusely lobate or distantly

crenate, and in no instance are the lobes of the fronds fully developed. They vary in width from one-eighth to one-half of an inch, but are usually about a quarter of an inch wide, diminishing slightly downwards, and rarely attaining a length of eight inches. The fertile fronds resemble the barren in development, but are still more curious, having occasionally only a few imperfect lobes about an eighth of an inch in length, and the rest of the sori borne on a narrow wing or membrane bordering the rachis, the whole width being under one-eighth of an inch. They vary, however, from this to a fuller development of rather more than half an inch wide, with more frequent lobes, and with fronds about eleven inches long. There are also produced fronds which are intermediate between the barren and fertile. It was found near Tunbridge Wells, Kent, in 1853, by Mr Wollaston, and is at present a unique and constant form

2. *heterophyllum* (W.). This form is probably the first step from the normal form towards the variety *strictum*, bearing two sorts of fronds, either separately or commingled. Some fronds are of the usual character, others have the segments more or less altered, becoming either narrowed and incised-dentate, or shortened to a semicircular outline, with the margin incise-dentate, and this in an unequal and irregular manner, though frequently portions of the fronds, sometimes entire fronds, bear the shortened segments, and are consequently linear in outline. As in many other varieties of this monstrous character, the plants, though not producing all the fronds affected, always bear affected fronds, and it is altogether a curious, constant, and rare variety It was found in 1853, near Tunbridge Wells, Kent, by Mr Wollaston

3. *strictum* (Francis). This variety, described by Mr Francis, from Westmoreland fronds communicated by Miss Beever, has been found more recently by Dr. Allchin, in Ireland, and again, by Mr F Clowes, near Bleak Holme, Windermere. The fronds are pinnatifid, the lobes being unsymmetrically and bluntly toothed, wavy laciniate, depauperate, and rarely bifurcate, the lower lobes resembling the upper valve of a small shell of the genus *Arca*. The fertile fronds are unknown. It is a permanent and graceful form, and very rare

4. *interruptum* (W.). This combines the peculiarities of several of the varieties before enumerated, and is very variable in its growth, but differs from all in having some fronds ramose, others normal but depauperated in part, and their apices bent down flacately, others of the intermediate semi-fertile character, with the lobes bifurcate, but all interrupted, and where this change of the lobes occurs, the frond forms an irregular curvature, and throws out an abortive frond, or what will probably prove to be a bulbil, resembling other proliferous forms. It was found near Tunbridge Wells, Kent, by Mr. Wollaston, and is a permanent and unique variety

5. *serratum* (W.). This form may have been originally caused by great luxuriance of growth, and excessive moisture, but it has proved constant more or less since 1853, when it was found by Mr Wollaston in a boggy ditch near Tunbridge Wells, Kent. The fertile fronds, nearly oval in outline, are about four and a half inches wide in the centre, and eighteen inches long, their lobes are sharply serrated, and one or more of the apical lobes start off nearly at a right angle forming other small fronds. The barren fronds are deeply serrated and frequently bifurcate; the semi-fertile fronds are normal, without serratures.

6. *multifidum* (W.) is the normal form, which occasionally (but neither uniformly nor symmetrically) divides once or more at the apex. It is not constant under cultivation, but is of frequent occurrence in damp shady places

7 *bifidum* (W.) is a further development of *multifidum*, caused by excessive shade and moisture. In this the apex is more frequently multifid, and rather crisped, and the lobes, both of the fertile and barren fronds, are sometimes affected, but not uniformly, in the same way It is a sub-permanent form and not uncommon.

8. *fissum* (M.). The peculiarity of this form is, that the apex of the rachis is, as it were, split down a few inches, both sides of the resulting branches bearing lobes, but those on the inner sides

rudimentary or very much smaller than those of the outer sides. The apices are sometimes somewhat multifid. It was found near Tunbridge Wells, and is not unfrequent, and tolerably constant. The appearance produced by the inequality of development in the [illegible] is similar to that of some kinds of *Gleichenia*.

9. *crispum* (W.). This is a permanent form, in which the apices of all the fronds are multifidly-crisped, and the lobes are wavy or curled, but very rarely divided. It has been found in Ireland, by Dr Kinahan, and near Tunbridge Wells, Kent, in 1851, by Mr Wollaston, and is not a common form.

10. *trinervium* (W.). This variety in its most marked character is no more than a trifoliated *Blechnum*, but it not unfrequently sends up fronds more or less multifid and crisped, with the lobes bifurcate. It is exceedingly rare, and was found in Ireland, in 1854, by Dr Kinahan, by whom the plants were sent to Mr Wollaston.

11. *cristatum* (W.). This constant form, so unlike *ramosum*, is, nevertheless, a beautiful connecting link between it and *crispum*. Its peculiarities consist in a development, as it were, of the blunt apical lobes of *crispum* into branchlets, differing in that respect from the compound ramifications of *ramosum*. Its basal lobes are frequently elongated and serrated, and the whole plant is very prone to throw up semi-fertile fronds, the lobes of which are sometimes bifid, and sharply serrated. It was found in 1853, near Tunbridge Wells, by Mr Wollaston.

12. *ramosum* (Kinahan). This is exactly analogous to *Scolopendrium vulgare*, var. *ramosum*. The rachis (very rarely the stipes) both of the fertile and barren fronds divides dichotomously into branches and branchlets, the apices of which are beautifully curled or tufted. The variety is very rare, and, as far as we know, has only been found near Upper Lough Breagh, Wicklow, Ireland, by Dr Kinahan; near Erifle, Mayo, Ireland, by Captain Eden; and by Mr J. Huddart, at Windermere, Westmoreland, the plants slightly differing. It is rather a shy-growing variety.

13. *multifurcatum* (M.). This is a handsome and vigorous variety, very irregular in its form, but quite constant to its peculiarities. These consist, first, in the occasional branching of the fronds once or twice near the base, and secondly in the apices of the fronds not so divided, as well as the branches of the [illegible] many times forked near the apex. The segments resulting from these apical furcations are most irregular in form, but they spread out, and are each of them extended into a lengthened acute point, of which the margins are irregularly notched, producing a somewhat ragged appearance. It was found in 1853, in a hedge-bank near Penryn, Cornwall, by Mr. F. Symons, and was communicated to us by Mr G. Dawson.

PLATE XLIV

THE COMMON BRAKES, OR BRACKEN

(PTERIS AQUILINA).

PTERIS, *Linnæus*

Clusters of Spore cases marginal, continuous, covered by the reflexed margins of the fronds, which become altered into a continuous membranous *indusium* opening on the inward side. *Veins* forked, from a distinct midvein, *venules* (barren) ununited, or (fertile) combined at their apices by the continuous receptacle.

P. AQUILINA, fronds bipinnate or tripinnate, pubescent beneath, primary pinnæ in pairs, alternate [illegible] (pinnules) sessile, the terminal one longer; rhizome creeping, subterraneous.

PTERIS AQUILINA, *Linnæus, Species Plantarum* 1533. *Bolton, Filices Britannicæ* 16, t. 10 (bad). *Smith, English Botany*, t. [illegible] 1679. *English Flora*, iv. 305. *Hooker and Arnott, British Flora* 575. *Mackay, Flora Hibernica*, 342. *Babington, Manual of British Botany*, 395. *Deakin, Florigraphia Britannica*, iv. [illegible] *Newman, History of British Ferns*, 2 ed. [illegible] *Moore, Handbook of British Ferns* 189. *Sowerby, Ferns of Great Britain* 57, t. 28. *Schkuhr, Kryptogamische Gewächse* [illegible] 95, 101. *Willdenow, Species Plantarum*, v. 402. *Sprengel, Systema Vegetabilium*, iv. 78. *Agardh, Recensio Specierum generis Pteridis*, 49. *Fée, Genera Filicum* 126. [illegible]

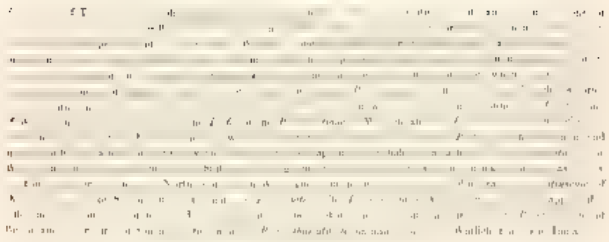
PTERIS [illegible], *Salisbury, Prodromus* 402.
PTERIS [illegible], *Gray, Natural Arrangement of British Plants*, ii. [illegible]
PTERIS [illegible], *Link, Enumeratio Plantarum Horti Regii Berolinensis* [illegible] 461 (ed. [illegible]), according to Link.
PTERIS [illegible], *Tausch, Botanische Zeitung* 1836 [illegible], according to Kuhlewein.
PTERIS [illegible], *Gaudichaud* [illegible] 42 [illegible], according to Kuhlewein.
PTERIS [illegible], *Wallich, Catalogue* [illegible] 3. *Agardh, Recensio Specierum generis Pteridis* 50.
PTERIS [illegible], *Blume, Enumeratio Plantarum Javæ* [illegible]
PTERIS [illegible], *Wallich, Catalogue* 105.
PTERIS [illegible], *Wallich, Catalogue* [illegible]
PTERIS [illegible], *Wallich, Catalogue* [illegible]
PTERIS [illegible], *Bory MS., Willdenow, Species Plantarum*, v. 403. *Sprengel, Systema Vegetabilium*, iv. 78, [illegible] *Enumeratio Plantarum Horti Regii Berolinensis*, ii. [illegible] *Agardh, Recensio Specierum generis Pteridis*, 51. [illegible] *Genera Filicum* [illegible]
PTERIS [illegible], *Fée, Genera Filicum*, 126, 128 [illegible]
PTERIS [illegible], *Chamisso, Prodromus* [illegible] 72. *Willdenow, Species Plantarum*, v. 393. *Schlechtendal, Adumbrationes*, [illegible] 20. *Agardh, Recensio Specierum generis Pteridis* [illegible]
ALLOSORUS AQUILINUS, *Presl, Tentamen Pteridographiæ* 153.
ALLOSORUS [illegible], *Presl, Tentamen Pteridographiæ* 347, according to Kuhlewein.
ALLOSORUS [illegible], *Presl, Tentamen Pteridographiæ* 54.
ALLOSORUS [illegible], *Presl, Tentamen Pteridographiæ* [illegible]
ALLOSORUS [illegible], *Presl, Tentamen Pteridographiæ* [illegible]
ALLOSORUS [illegible], *Presl, Tentamen Pteridographiæ* [illegible] 4.
CINCINALIS [illegible], *Gleditsch*, [illegible] 25 [illegible], according to Sprengel.
EUPTERIS AQUILINA, *Newman, Phytologist*, v. 278. *Appendix* [illegible] *British Ferns*, 3 ed. 33.

EXPLANATION OF THE PLATE.

PLATE X[illegible].—PTERIS AQUILINA. A, from Barnes Common, Surrey. *T. M.* B, P. AQUILINA [illegible], from Hampstead. *T. M.* C, P. AQUILINA [illegible], from Hampstead, Middlesex. *T. M.* D, P. AQUILINA [illegible], from Chislehurst, Kent. *G. B. Wollaston.*

HABITAT. The Bracken is the most abundant of our wild Ferns, occurring in woods, thickets, and waste places, but apparently avoiding a chalky soil. It is spread over Great Britain, from Cornwall to the Shetlands, and is plentiful in Ireland and the Channel Isles, descending to the sea level, and reaching an elevation of nearly 900 feet in the Highlands of Scotland. When growing exposed, it is a harsh, rigid-looking plant, but when in its most luxuriant state, it is extremely beautiful; and certainly none of our British species exceed this in elegance, or producing the more grandeur which we have witnessed in [illegible] fronds, eight or ten feet high, gracefully arching out from among the underwood which skirted a deep shady lane in the west of Surrey.

GEOGRAPHICAL DISTRIBUTION. This is a common Fern in Europe, as it appears to be also in most other parts of the world, many of the species so called being undistinguishable by any constant or sufficient characters. In Asia it is found in [illegible] (*H. Lindley*) in Sitka and Kamtschatka, in Siberia at the mouths of Lake Baikal, in Altai and the [illegible] in Persia, [illegible] the Philippines, in the Mauritius and [illegible] [illegible] In Africa it [illegible] at the Cape of Good Hope, [illegible] *Lindley*, Senegambia and [illegible] (*Hooker*) in [illegible] and [illegible] In America it has been found in California, [illegible] Mexico, in Veraguas [illegible] in the Sandwich Islands [illegible] (*Sir Hooker*) [illegible] parts of North America. The *Pteris lanuginosa* of [illegible]



Rhizome as thick as one's little finger, subterraneous, creeping, black and somewhat velvety externally, white succulent and starchy within. *Fibres* branched, downy.

Stipes lateral and distant on the rhizome and adherent to it, round-shaped, black and velvety at the base, naked beneath the surface, above yellowish green, pubescent when young, afterwards smooth but sharply angular when mature, and about or rather over half the length of the frond, a transverse section shows the ends of the vascular bundles arranged so as to present a fancied resemblance to the imperial eagle, whence the specific name. *Rachis* channelled above, rounded behind, sometimes slightly asperulous.

Vernation circinate, the rachis is in an early stage bent down abruptly close against the stipes.

Fronds variable in size, outline and composition, deep green. In poor soils they vary from six to eighteen inches in height, and in more favourable localities they reach from three or four to eight or ten feet or more in height, in the former cases the outline is nearly triangular, and from the lower pair of branches only being well developed, they appear three-branched, in the latter cases they are more elongated or oblong, and the growth consists of a series of branches or pinnæ successively developed. In composition the smaller are bipinnate, the larger fronds tripinnate. *Pinnæ* or *branches* ovate or oblong-ovate, opposite, often distant. *Pinnules* or *secondary pinnæ* narrow lanceolate or narrowing from a broad base, opposite or alternate, contiguous, blunt-ish or sometimes caudate. *Pinnulets* sessile, entire or sinuate, oblong and adnate by their whole breadth or more ovate pinnatifid, and then with a narrower attachment, blunt at the apex, smooth above, hairy beneath, the pinnatifid ones with blunt linear oblong or shorter triangular lobes.

Venation of the more entire pinnulets, consisting of forked veins arcuately spreading from a stouter midvein, these veins are one, two, or three times forked, the *venules* extending to the margin. In the pinnatifid pinnulets the veins become secondary midveins to the lobes, and give off a series of once or twice forked veins, in these latter the lowest branches right and left of the secondary midveins frequently meet and unite forming a series of costal areoles. A little the edges of the fertile pinnulets extends a longitudinal submarginal vein which becomes the receptacle.

Fructification abundant on the back of the fronds, sub-marginal. *Sori* linear, continuous, the receptacular vein occupying nearly the margin of the pinnulets, and lying as it were in the axil of the indusium. *Indusium* linear continuous consisting of a thin whitish fringed membrane growing from the outer edge of the receptacle, and folded inwards over the spore-cases, beneath the spore-cases and growing from the inner edge of the receptacle is another similar fringed membrane, the fringes consist of small jointed hairs. *Spore-cases* roundish obovate. *Spores* round oblong or angular muriculate.

Duration. The rhizome is perennial. The fronds are annual growing up early in May but very impatient of cold or frosts, and killed by the early frosts of autumn.

A common and well known Fern, but also easily recognised technically among British Ferns, by the continuous lines of marginal sori, on compound fronds, not contracted. Like all other widely diffused

Pteris aquilina.

species is subject to variations of outline and division, as well as of vestiture, but the variations are of little importance. The nature of the membrane which is found lying beneath the sori, at least in the fully fructified fronds, has not been well explained. It would indeed seem that the lines of spore-cases lie between two unequal membranes naturally projected outwards from the marginal receptacle (the fructification having so far some resemblance to that of *Lindsæa*), the revolution of the margin however actually bringing the smaller of these membranes beneath, while the other lies over the spore-cases as a cover. This latter must be regarded as the true indusium, while the former is probably of the nature of an accessory indusium.

The Bracken is not an ornamental plant, in the usual sense of the expression, indeed in pots or in small rockeries, it is rather weedy than ornamental. Nevertheless there are situations in which it may be cultivated with advantage. Thus, for example, it may be grown for ornament about the margins of that class of plantations which skirt approach roads or screen unsightly objects; and it may also be used with advantage for the purpose of affording shelter, or cover in the more open plantations of parks and paddocks. There has been an impression that the *Pteris* is difficult to transplant successfully this impression may, with probability be traced to a statement, long since made by Sir J. E. Smith, to this effect. If, however, the subterraneous horizontal rhizome is dug up in winter without injury, and planted with ordinary care, there is little risk of failure. The plant is not at all particular as to soil, except that it seems to avoid chalk, though no doubt a deep sandy loam is most congenial to it.

There are few varieties of the Bracken as yet discovered these few are as follow —

1. *integerrima* (M.). The peculiarity of this form consists in the comparative entirety of the secondary pinnules (pinnulets), these, instead of being mostly and deeply pinnatifid are nearly all quite entire, or here and there only one or two of the basal ones are slightly crenato-lobate. It is not uncommon, and probably merges into the pinnatifid form but many plants and patches of plants are found possessing this peculiarity in a striking degree. There is also a young form of this variety in which the primary pinnæ are deltoid, and the pinnules of the secondary pinnæ sessile, very broad, and regularly crenate, having something of the appearance of *Litobrochia esperidiosa*. It is not uncommon in shady woods.

2. *crispa* (W.). There are two forms of this variety the divisions of both corresponding with the normal growth of the species, but are occasionally multifid. One has the margins of the pinnulets entire undulate and reflexed, as in *Athyrium Filix-fœmina rhæticum*, the other has them crenate and corrugately waved, as in *Scolopendrium vulgare crispum*. It is not an uncommon, but a local variety

3. *multifida* (W.). This, in its best condition, is a rather unusual form of the plant, and like many other varieties bearing this name, is only sub-permanent with this exception it is analogous to the *Athyrium Filix-fœmina multifidum*. There are two sub-forms of it: one, in which the apex of the frond and the apices of most of the primary pinnæ are multifidly-crisped, the other in which the apex of the frond and of the primary pinnæ are rarely multifid, but the apices of the secondary pinnæ (pinnules) and many of the pinnulets are affected instead. Many localities produce one or other of these forms, the most marked of the former are from near Chislehurst, Kent, and of the latter from near Ottery St. Mary Devon both found by Mr Wollaston. We have also received the former from Devon from the Rev. J. M. Chanter and from Guernsey gathered by Miss Wilkinson and Mr C. Jackson and the last named has been found by Mr S. O. Gray in Cobham Park, Kent, and also by Mr Chanter in Devonshire.

4. *depauperata* (W.). This Mr Wollaston describes as a most curiously depauperate form of the last but non-permanent as regards this state, and only sub-permanent as regards its multifid state nevertheless deserving of record. The divisions of the frond correspond with those of *multifidum*, but the pinnulets or rather the crenatures of the multifid apices of the primary pinnæ, and the base of the secondary pinnæ are all recurrent, depauperate, attenuated and occasionally interrupted. It has been found in two woods near Chislehurst, Kent, by Mr Wollaston and at Bowness in Cumberland by Mr Wood

Plate XLV.

THE COMMON MAIDENHAIR FERN
(Adiantum Capillus-Veneris).

ADIANTUM *Linnæus.*

Clusters of Spore-cases transverse, marginal, [illegible] oblong or roundish, situated on the under surface of the reflexed [illegible] the sori therefore resupinate. *Indusium* of the same form, membranaceous, traversed by [illegible] veins, and bearing the spore-cases [illegible] its under surface [illegible] radiately forked, *veinlets* disunited at their apices.

A. Capillus-Veneris, fronds [illegible] pinnate or tripinnate [illegible] alternate [illegible] membranaceous, obliquely and broadly wedge-shaped, or roundish [illegible] a truncate base [illegible] by capillary stalks, the superior margin [illegible] the sterile lobes [illegible] the fertile [illegible] or truncate; sori transversely oblong, often occupying the whole width of the lobes; stipes and rachis ebony black, glossy, quite smooth.

Adiantum Capillus-Veneris, *Linnæus, Species Plantarum,* [illegible] Bolton, *Filices Britannicæ,* [illegible] 20. Smith, *English Botany,* [illegible] 1564. *English Flora,* [illegible] 295. Hooker and Arnott, *British Flora,* 576. Babington, *Manual of British Botany,* [illegible] *Flora* [illegible] Deakin, *Florigraphia Britannica,* [illegible] Newman, *History of British Ferns,* [illegible] Moore, *Handbook of British Ferns,* [illegible] Sowerby, *Ferns of Great Britain,* [illegible] Jacquin [illegible] Willdenow, *Species Plantarum,* [illegible] Presl, *Tentamen Pteridographiæ,* [illegible] Hooker, *Species Filicum,* [illegible] Fée, [illegible]

Adiant[illegible] [illegible] *Schrader's Journal für die Botanik,* [illegible] Sprengel, *Systema Vegetabilium,* [illegible]

Adiantum coriandrifolium, Lamarck, *Encyclopédie,* [illegible] 43. *Flore Française,* [illegible]

Adiant[illegible] [illegible] *Synopsis* [illegible] Gray, *Natural Arrangement of British Plants,* [illegible] 17.

Adiant[illegible] [illegible] *Chapman MS.* [illegible]

Adiant[illegible] [illegible] *Tausch* [illegible] according to Mettenius.

Adiant[illegible] [illegible] *Brown, Appendix to Tuckey's Voyage,* [illegible]

Adiantum [illegible] *Willdenow, Herb.* 20[illegible]

Adiantum [illegible] *Link, Filicum Species,* 7. *Fée, Genera Filicum,* 11[illegible]

Adiantum [illegible] *Stokes, Botanical Materia Medica,* [illegible]

EXPLANATION OF THE PLATE.

Plate XLV. [illegible] Capillus-Veneris. A, from [illegible] by Rev. J. M. Chanter. B, from Cornwall [illegible] E. J. Lowe. C, [illegible]

Habitat.—This fern is a maritime rock-plant, being found on [illegible] part of our coast [illegible] and in the fissures of rocks [illegible] scarcely ascending [illegible] Cornwall, Devon, and [illegible] Isle of Man [illegible] Clare. There [illegible] Stafford, Salop [illegible] and York [illegible] Scotland [illegible] In the latter county Mr. D. [illegible] in 1842 [illegible] near the sea, northeast of Stonehaven [illegible] banks of the Carron [illegible] apparently rare in Jersey.

Geographical Distribution.—The common Maidenhair [illegible] south of Europe. In Asia [illegible] Nepal, Sumatra [illegible] Bootan, Assam, Sikkim [illegible] Kashmir [illegible] Affghanistan [illegible] China [illegible] *Hooker* [illegible] Syria [illegible] Teneriffe, Madeira [illegible] Cape of Good Hope [illegible] North America [illegible] Mexico [illegible] South America [illegible] Trinidad, St. Vincent [illegible] New Hebrides (*Sir W. Hooker*) [illegible]

Rhizome slowly creeping, as thick as a small [illegible], densely scaly. *Scales* dark brown, narrow lanceolate acuminate, strongly veined. *Fibres* wiry, branched, shaggy.

Stipes lateral, adherent to the rhizome, and as well as the *rachis* [illegible] blackish purple, smooth [illegible] with a few scattered scales near the base [illegible] as long as the fronds.

Venation circinate.

Fronds usually ovate or triangular, sometimes oblong or lanceolate, membranaceous, glabrous, bright green, drooping, from six to twelve, sometimes eighteen inches in length, bipinnate or tripinnate. *Pinnae* and *Pinnules* alternate, the latter of various forms, roundish with the base truncate, sub-rhomboidal, or obliquely fan-shaped but generally more or less cuneate at the base, attached by a [illegible] stalks; the posterior margins [illegible] the superior lobate; the sterile lobes dentate or inciso-dentate, the fertile obtuse or truncate, the *sori* often occupying their entire width.

Venation of the pinnules consisting of a series of dichotomous ramifications of the vascular bundles of the petioles; the first furcation forming the extreme base of the pinnule, and the *veins* becoming again and again forked in a flabellato-radiate manner, until the whole pinnule is traversed by a series of contiguous and therefore nearly parallel *venules*, which are disunited at their apices. In the sterile portions, one of these venules is directed to each marginal tooth, in the apex of which it terminates. In the fertile portions, the venules extend to the margin, and are thence continued nearly across the indusium, there forming the receptacles.

Fructification on the back of the fronds, generally distributed. *Sori* oblong, more or less lengthened according to the width of the lobe on which they are borne, seated on the under surface of [illegible] borne on the apices of all the lobes into which the anterior margin of the pinnules is divided. *Indusium* of the same form, consisting as it were of a portion of the apex of the lobe, reflexed, and changed into a thin bleached veiny membrane. *Spore-cases* globose. *Spores* roundish or angular, ovate, smooth.

Duration. The rhizome is perennial. The fronds are persistent, remaining until after young ones are produced, if kept from being injured by frost. The young growth commences in April and May.

The Adiantum is unlike every other British Fern; its black, shining, slender stipes, capillary ramifications, and fan-shaped pinnules, irrespective of its fructification, at once distinguish it.

The Maidenhair grows freely—in a moist close greenhouse, or in the stove, the temperature of which it enjoys—in the usual light compost of turfy peat and sand, with abundant drainage. The rhizome should not be buried in the soil, but fixed on the surface. The plants are injured by severe cold, even when in a closed house, so that it cannot be considered a hardy Fern. Propagation is effected by division of the rhizomes.

Ranging so widely over the world, it might be expected that modifications of form would occur, and such indeed is the case, two or three being met with even in this country. In addition to the usual state with lobed and decidedly wedge-shaped pinnules, we have, therefore, the following:—

1. *multifidum* (W.). Dichotomous growth rarely occurs in this genus, but is occasional and inconstant.

2. *incisum* (M.). This has both the barren and fertile pinnules deeply pinnatifid, or split down into long narrow lobes, but is otherwise of the usual growth. Marked examples are rare in this country; one found in Ireland by Dr. Allchin in 1853 is constant. Mr. Newman notices another from Mewstone Bay, in Devonshire. There are, however, various gradations of this structure, both native and foreign.

3. *rotundatum* (M.). This sub-variety, found in the Isle of Man (a very similar one also on the south-west coast of England) has at first sight a different aspect. We have to thank Mr. Wilson and Mr. Rylands for fronds from the Manx locality, and several correspondents have furnished the analogous specimens from the English coasts. The chief peculiarity in the most marked, i.e., the Manx plant, consists in the basal pinnules having a rounder outline than usual, with the base truncate; the usual cuneated base, wanting in these pinnules, appearing, however, in the upper parts of the same fronds. In addition, the fronds are narrow and the pinnae more spreading. We cannot, however, fix the limit of these peculiarities, intermediate and connecting specimens occurring from various localities.

Adiantum Capillus-Veneris.

PLATE XLVI. A

THE BRITTLE BLADDER FERN
(CYSTOPTERIS FRAGILIS).

CYSTOPTERIS, *Bernhardi*.

Clusters of Spore-cases roundish [illegible] growing from the back of the veins, [illegible] *Indusium* [illegible] or [illegible] fixed by its broad base [illegible] the sorus and [illegible] over it at length reflected, the free (anterior) margin [illegible] acute or acuminate, often fringed. *Veins* [illegible] at their extremities, branched, the branches (*venules*) simple or forked.

C. FRAGILIS: fronds [illegible] lanceolate, [illegible] rarely [illegible] or [illegible]-tripinnate; pinnae ovate-lanceolate or oblong-lanceolate; pinnules ovate-lanceolate or oblong [illegible] or acute, obscurely toothed [illegible] with short [illegible] or [illegible] teeth, or pinnatifid with ovate or oblong [illegible] segments.

C[illegible] *Bernhardi*, [illegible] *Schrader's Neues Journal für die Botanik*, [illegible] part 2. 26. [illegible] *Hooker and* [illegible] *British Flora*, [illegible] *Babington, Manual of British Botany*, 412. *Deakin, Florigraphia Britannica*, [illegible] *Flora* [illegible] *Newman, British Ferns*, [illegible] *Moore, Handbook of British Ferns*, [illegible] *Ferns of Great Britain*, [illegible] *Hooker, Genera Filicum*, [illegible] *Species Filicum*, [illegible] *Filicum Species*, 10. *Presl, Tentamen Pteridographiae*, 93 [illegible] *Fée, Genera Filicum*, 293.

[illegible] *Decaisne*, [illegible]

POLYPODIUM FRAGILE, *Linnaeus, Species Plantarum*, [illegible] *Bolton, Filices Britannicae*, [illegible] 27 [illegible]

POLYPODIUM [illegible] *Hoffmann, Deutschlands Flora*, [illegible] 9.

POLYPODIUM [illegible] *Hoffmann, Deutschlands Flora*, [illegible] 9.

POLYPODIUM [illegible] *Hoffmann, Deutschlands Flora*, [illegible] 10 (according to [illegible])

[illegible] POLYPODIOIDES [illegible] *Villars, Histoire des Plantes du Dauphiné*, [illegible]

POLYPODIUM [illegible] *Withering, Arrangement of British Plants*, iii. 779.

POLYPODIUM [illegible] *Lamarck, Flore Française*, [illegible]

POLYPODIUM [illegible] *Plantae Cryptogamicae*, 315.

POLYPODIUM [illegible] *Berlin Magazin*, [illegible] (according to Sprengel).

ASPIDIUM FRAGILE, *Swartz, Schrader's Journal für die Botanik*, [illegible] *Sprengel, Filicum*, [illegible] *Willdenow, Species Plantarum*, v. 280. *Schkuhr, Kryptogamische Gewächse*, [illegible] *Sprengel, Systema Vegetabilium*, [illegible]

ASPIDIUM [illegible] *Swartz, Schrader's Journal für die Botanik*, 1800, ii. [illegible] syn. Eng. Bot.).

ATHYRIUM [illegible] *Sadler, Adumbratio* [illegible] *Hungariae*, 22.

[illegible] FRAGILIS, *Smith, Mémoires de l'Académie Royale des Sciences de Turin*, [illegible] *Flora Britannica*, [illegible] *English Botany*, [illegible]

CYATHEA [illegible] *Roth, Flora Germanica*, iii. [illegible]

C[illegible] ANTHRISCIFOLIA, *Roth, Flora Germanica*, iii. [illegible]

CYATHEA FRAGILIS, *Smith, English Flora*, iv. [illegible]

C[illegible] *Smith, English Flora*, iv. 289 (in part [illegible] plants).

C[illegible] FRAGILIS, *Gray, British Plants*, ii. [illegible]

Narrow pinnuled often large and [illegible]-dentate forms (angustatae)

POLYPODIUM FRAGILE ANGUSTATUM, *Hoffmann, Römer and Usteri's Botanisches Magazin*, [illegible]

POLYPODIUM [illegible] *Hoffmann, Deutschlands Flora*, ii. 9.

POLYPODIUM [illegible] *Dickson, Hortus Siccus*, [illegible] *Bolton, Filices Britannicae*, [illegible] *Withering, Arrangement of British Plants*, iii. 780.

POLYPODIUM POLYMORPHUM [illegible] *Villars, Histoire des Plantes du Dauphiné*, iii. 843, [illegible]

POLYPODIUM [illegible] RHAEOIDES [illegible] *Weiss, Plantae Cryptogamicae*, [illegible]

CYATHEA ANGUSTATA, *Smith, English Flora*, iv. 293 (excl. syn. *Aspidium* [illegible]).

CYATHEA [illegible] syn. Ray and Plukenet [illegible] *Flora Britannica*, iii. [illegible]

CYATHEA [illegible] ANGUSTATA, *Link, Filicum Species*, [illegible] (excl. syn. Linnaeus and Schkuhr).

CYATHEA [illegible] *Roth, Flora Germanica*, iii. [illegible]

CYSTOPTERIS [illegible] *Link, Hortus Regius Berolinensis*, [illegible] *Fée, Genera Filicum*, [illegible]

CYSTOPTERIS DENTATA, *Hooker, British Flora*, [illegible]

CYSTOPTERIS FRAGILIS, β. *Moore, Handbook of British Ferns*, [illegible]

ASPIDIUM FRAGILE, β. *Willdenow, Species Plantarum*, v. [illegible] (excl. syn. Ray and Plukenet).

[illegible] FRAGILIS, β [illegible] *Gray, British Plants*, ii. [illegible]

Blunter-pinnuled less-toothed or blunt-toothed forms (dentatae)

[illegible] DENTATUM, *Dickson, Plantae Cryptogamicae Britanniae*, [illegible] 7. fig. 1.

POLYPODIUM [illegible] *Allioni, Flora Pedemontana*, ii. 286. *Swartz, Synopsis Filicum*, [illegible] *Seguier, Plantae Veronenses*, [illegible]

ASPIDIUM DENTATUM, *Swartz, Synopsis Filicum*, [illegible] *Willdenow, Species Plantarum*, v. [illegible] *Sprengel, Systema Vegetabilium*, iv. 104.

[illegible] *Martens and Galeotti, Mémoires de l'Académie Royale de Bruxelles*, [illegible] 67.

ASPIDIUM [illegible] *Willdenow, Species Plantarum*, v. 279.

ASPIDIUM [illegible] *Kunze*, [illegible] *Chi*[illegible] (according to [illegible]).

[illegible]

Var. DICKIEANA: pinnae deflexed, overlapping; pinnules crowded, broad, obtuse, decurrent, very slightly toothed, or bluntly lobed with the lobes scarcely toothed; sori [illegible]

[illegible]

EXPLANATION OF THE PLATE.

[illegible]

[illegible]

[illegible]

Caudex short, tufted, decumbent, slowly spreading, scarcely creeping, i.e. advancing laterally by the successive projection of the fronds, which form a tuft at the extremity; somewhat scaly. *Scales* pale brown, lanceolate. *Fibres* branched, wiry, numerous.

Stipes slender, brittle, readily breaking away from the caudex, dark brown at the base, and there furnished with a few narrow lanceolate scales, paler or green and smooth upwards; terminal and adherent to the caudex.

Vernation circinate.

Fronds from three or four to twelve or eighteen inches in length, erect, herbaceous, dull green

A . Cystopteris fragilis.

B . C.regia. C . C.montana .

smooth, oblong-lanceolate, sub-bipinnate, bipinnate, or rarely tripinnate. *Pinnæ* ovate-lanceolate or oblong-lanceolate, with the pinnules usually distinct, sometimes more or less decurrent or connected by a wing to the rachis. *Pinnules* of the more typical forms ovate at the base of the pinnæ, oblong towards the apex, generally acute but sometimes bluntish, the larger deeply pinnatifid, with oblong toothed lobes, the smaller incise-dentate or more shallowly toothed, the teeth generally acute. In the *angustata* series of forms the pinnules are narrower and more conspicuously and acutely toothed; in the *dentata* series, they are not so much separated, and are shorter, and usually, though not always, less deeply toothed, but always with the teeth blunt.

Venation of the larger pinnules consisting of a flexuous midvein, from which a branch or vein proceeds along each lobe, giving off secondary branches, or *veinlets*, mostly simple, one of which proceeds to the top of each primary tooth. The smaller *pinnules* more or less resemble the larger of these lobes, and are also similar as regards their venation.

Fructification scattered over the whole back of the frond. *Sori* roundish in outline, numerous, borne on nearly all the branches of the veins in fully fructified fronds, and thus in the more divided forms appearing to be scattered without order over the whole surface, but in the less divided forms more evidently placed in a line, near the margin of the pinnules, as they often are in the lobes of the larger ones, though in some forms they are situated nearer the midrib than the margin, and often in age become confluent, indusiate, medial on the veins. *Indusium* a thin smooth delicate hooded membrane, attached behind the sorus, affixed to one side, either truncate and thus roundish, or prolonged at the point and thus acutely or acuminately ovate, at first inflected forwards over the spore-cases soon, however, becoming reflected backwards and shrivelled, the anterior margin either entire or split into narrow segments. *Spore-cases* roundish obovate. *Spores* round or oblong, strongly echinate.

Duration. The caudex is perennial. The fronds are annual, appearing in April or May, they quickly arrive at maturity, and are followed by others in succession through the summer, and are destroyed by the early frosts of autumn.

Viewed as a collective species—and it cannot be satisfactorily viewed in any other light—this Fern is easily enough recognised by its small slender fragile bipinnate oblong-lanceolate fronds, and the peculiar hooded or somewhat calyciform indusium, which in the early stages of the fructification may be seen enclosing the roundish masses of spore-cases. It is a plant so polymorphous in character that the species which botanists have from time to time endeavoured to separate from it, though sometimes assuming a distinct-looking aspect, are at other times not easily to be recognised, and are scarcely to be defined permanently, even as varieties. The *Cystopteris fragilis* may indeed be considered as being, like the *Athyrium Filix-fœmina* and *Lastrea dilatata*, a botanical *ignis fatuus*, alluring the incautious novelty seeker among the quagmires of species-making in which, when at length his mental vision becomes cleared by more extended observations, he finds himself hopelessly wandering.

The indusium of *Cystopteris* when assuming the truncated somewhat calyciform character it sometimes bears, stands in the same relation to the hemitropal scales found behind the sori in some species of *Alsophila*, as the more perfect cup in *Woodsia*—a true cup in some exotic species—does to that of *Cyathea*. These genera thus become connecting links between the polypodiaceous and cyatheaceous series. *Cystopteris* has also a close affinity with that genus of dwarf-wood ferns, called *Acrophorus*.

This is a pretty little fern for the cultivator, affording some variety in his collection, and thriving well either in pots in frames or greenhouses, or on open shady rock-work in localities which enjoy a moderately pure atmosphere. The soil may be composed of light turfy peat and loam, with sand in equal parts, and the drainage should be ample. It increases readily by division or from the spores. The fronds are frequently damaged by the ravages of a yellow Fungus (*Uredo filicum*), which sometimes very soon spoils those plants which are seriously attacked. From its most commonly [illegible]

confined dampness generally maintained in structures where ferns are grown, but as we find native specimens from Ben Lawers and from Ireland are similarly affected, it would appear to be a natural [illegible]

[illegible] forms [illegible] from [illegible] Fern [illegible] following, which are, however, not always so well defined as could be wished.

1. *angustata* (Smith). The form to which this name has been given appears to be one of the larger states of the species, and includes those forms in which the edges of the smaller pinnules, and of the lobes of the larger ones, are deeply and rather evenly incised into conspicuous longish narrow teeth. According to Sir J. E. Smith this is the same as the *Polypodium rhaeticum* of Dickson and of Bolton (*Fil. Brit.* t. 45). The spores (in Dickson's plant) are roundish and echinate. Mr Wollaston and others think it is not a very constant form and probably there are more than one to which the name is applied, some of which may revert under culture to the ordinary state; but we have a plant smaller indeed than Smith's description seems to point out, which we include under *angustata*, and this with us is quiet constant under cultivation. It is more attenuated in the frond, the pinnæ, and the pinnules, and these are its chief characteristics.

2. *obtusa* (M.). This is a distinct and constant form, cultivated by Mr A. Tait, of Edinburgh. It is peculiar in its short blunt ovate narrowly and shortly stalked pinnules, which are deeply separated into distinct oblong lobes, almost pinnules, and these are notched with small even teeth, which are very apparent. The spores are echinate. The colour of the fronds is a dark green.

3. *dentata* (Dickson). There are some cultivated forms referable to this variety that are constant, though it is probable that accidentally blunt pinnuled fronds of other forms are sometimes associated with it in the herbarium, and hence it is often looked on as inconstant. The features of the true plants are, small size (four to eight inches long), and confluent pinnules, so that the narrow fronds are sometimes scarcely bipinnate; these pinnules are blunt-oblong, simply blunt-toothed, or obscurely blunt-lobed, and with the sori placed near their margin. Somewhat larger and more deeply lobed forms, having the same aspect, are met with, and through these it gradually merges into *obtusa* and the normal form. The spores are echinate, but scarcely in so marked a degree as they are in *C. fragilis* itself.

4. *decurrens* (M.). A variety intermediate in aspect between *dentata* and *Dickie*, approaching the latter in the decurrent pinnules and deflexed pinnæ, but different in the more acute apices of the fronds and pinnules, and in the more erect and prominent teeth, which rather resemble the former as does the colour and texture. The spores are echinate. It was found by Mr Tait, on the coast of Fifeshire.

5. *Dickieana* (Sm.). The most marked in habit of all the known forms, but connected with *fragilis*, through *decurrens* and *dentata*, and therefore only to be considered as a variety. Its peculiarities consist in the deflexed pinnæ more or less overlapping, and in the crowded overlapping position of the broad short obtuse bluntly-toothed pinnules, which are all connected by the wing of the rachis in which they are decurrent. The colour is uniformly a deep bright green. In the more highly developed of the fertile fronds the lobes of the pinnules, though still blunt, are more distinct, and they have then blunt inconspicuous teeth. The sori are situated very near the margin. The pinnæ are twisted more or less from the plane of the frond, as occurs in some degree in *dentata*, from which, with the deflexion of the pinnæ and the frequent confluence of the pinnules, results a peculiar aspect, by which this variety is known at first sight. The spores are slightly verrucate or tuberculate, not echinate-tuberculate as in the other varieties, a fact, we believe, first pointed out by Mr Wollaston. The plant was first found by Dr Dickie on dripping rocks in a cave at Cove, near Aberdeen, and it has since been gathered in the same place by several botanists, and by Dr Balfour, near Dunkeld. In cultivation this sometimes produces fronds or pinnæ, with the apices multifid.

6. *multifida* (W.). In this, which is not permanent, the apices of the pinnæ or of the frond are bifid or multifid, or the stipes is divided.

7. *interrupta* (W.). A curious permanent monstrosity, found in Westmoreland by Mr F. Clowes. The fronds are all dissimilar, but mostly linear, and all more or less narrowed, from the altered or interrupted or contracted state of the pinnæ. These are sometimes reduced to small fan-shaped or three-lobed expansions along a portion of the frond, which is there narrow-linear, or the pinnæ consist of two to four or six very unequal and irregular, often fan-shaped, pinnules, still producing a narrow and contracted outline. The pinnules in the interrupted portions are variously truncated, laciniated, depauperated, or sometimes bifid or multifid. It is a curious plant and quite permanent.

8. *sempervirens* (M.). There is another form reputed to have been found both in Devonshire and Kent, also a native of Madeira, which has several distinctive features, and may be called *C. fragilis sempervirens*.* There are some doubts as to the English origin of this plant, but of its distinctness as a variety, and probably as a species, none. Bolton's figure (t. 45), under the name of *Polypodium rhaeticum*, is a facsimile of moderate-sized specimens, and he besides mentions two of its prominent characteristics; if, therefore, his statement is conclusive, which may be open to doubt, it is a native of Scotland. It is certainly a native of Madeira, whence we have imported plants received from Mr Sim of Footscray, and probably occurs also in the other North African Islands. It has also certainly been found at Tunbridge Wells, and is in cultivation from this source; but there are rumours of its having been planted there. A similar, but not identical, plant, of which a counterpart is also found in Madeira, agreeing, however, with the other in its principal features, is loosely stated to have been found in Devonshire; but this indication of a British habitat is also open to suspicion, the garden whence it has been distributed having been enriched by importations from Madeira. Whether Presl's *C. sempervirens* be the same, there appears no means of determining, except by a reference to the Berlin herbaria, as he has not published any definition or character of his plant; and the same may be said of the *C. azorica* of Fee. The striking differences presented by the plants under notice are (1,) their evergreen character under shelter, those kept in a cold greenhouse—from which, in fact, frost was not excluded—continuing to grow in succession through the whole winter, while all other known forms of *Cystopteris* are quite dormant; (2,) the toughness, not brittleness, of their pallid stoutish stipes, which are not easily broken; (3,) the greater size of the anterior basal pinnules—these two features being mentioned by Bolton as belonging to his plant; and (4,) the glandular-hairy vestiture of the indusium, which is conspicuous in the fresh plant. In all these peculiarities, the Madeira, and reputed Tunbridge Wells, and Devonshire specimens perfectly agree; but the latter is somewhat more slender in the stipes, and more acute in the pinnules, than the others, which are identical. This evergreen species, for such we believe it to be, has, in addition, a short creeping rhizome, a gerous fronds of narrowish lanceolate outline, and distinct and rather distant pinnules, of which the larger are often [illegible] or quite again pinnate, and [illegible] separate. The spores are irregularly roundish oblong, muricate.

* Perhaps it would be more correctly regarded as a species, when it might well bear the name of *C. [illegible]*.

PLATE XLVI. B.

THE ALPINE, OR ROYAL BLADDER FERN

(CYSTOPTERIS REGIA).

CYSTOPTERIS, *Bernhardi*

Clusters of Spore-cases roundish, growing from the back of the veins, medial or [illegible]. *Indusium* hooded or cucullate, fixed by its broad base posteriorly beneath the sorus, and [illegible] over [illegible], at length reflected, the free (anterior) margin truncate, acute or acuminate, often fringed. [illegible] distant at their extremities, branched, the branches (*venules*) simple or forked.

C. REGIA: fronds lanceolate, bi- or subtripinnate; pinnæ ovate; pinnules ovate-oblong, [illegible] by a wing, deeply pinnatifid, the lobes linear or linear-oblong, with two or three short blunt or retuse teeth, [illegible] wedges above; veins terminating in the apical notch of the emarginate teeth.

[illegible] REGIA, *Presl. Tentamen Pteridographiæ*, 93. *Fée*, [illegible] *Filicum*, 299.

[illegible] ALPINA, *Desvaux*. *Link*, *Hortus Regius Berolinensis*, ii. 130. *Filicum Species*, [illegible]. *Hooker*, *British Flora*, 446. *Species Filicum*, [illegible]. *Hooker and Arnott*, *British Flora*, 572. *Babington*, *Manual of British Botany*, 12. *Moore*, *Handbook of British Ferns*, 78. *Sowerby*, *Ferns of Great Britain*, 40, 23.

P[illegible] [illegible], *Linnæus*, *Species Plantarum*, 1553.

POLYPODIUM [illegible], *Lamarck*, *Flore Françoise*, [illegible].

[illegible], *Villars*, *Histoire des Plantes du Dauphiné*, iii. 847, 53 f. c.

POLYPODIUM [illegible], *Wulfen*, *Jacquin's Collectanea*, ii. 171. *Jacquin*, *Icones Plantarum Rariorum*, iii. 642.

POLYPODIUM [illegible], *Goertn. Illustrationes Botanicæ*, [illegible].

ASPIDIUM REGIUM, *Swartz*, *Schrader's Journal für die Botanik*, 1800, ii. [illegible]. *Synopsis Filicum*, 58. *Willdenow*, *Species Plantarum*, v. 281. *Sprengel*, *Systema Vegetabilium*, [illegible].

ASPIDIUM ALPINUM, *Swartz*, *Schrader's Journal für die Botanik*, 1800, ii. 42. *Synopsis Filicum*, 60. *Willdenow*, *Species Plantarum*, v. 282. *Schkuhr*, *Kryptogamische Gewächse*, 60, [illegible] 62, 62 b. *Sprengel*, *Systema Vegetabilium*, [illegible] 109.

ASPIDIUM [illegible], *Bory and Chaub.*, [illegible] 288 (in part, according to specimens in Hb. Mus. Brit. and Hb. Hook.)

CYATHEA [illegible], *Smith*, *English Botany*, iii. 163.

CYATHEA REGIA, *Forster*, *Sowerby's Synopsis Plantarum*, [illegible]. *Smith*, *Flora Britannica*, iii. 1140 (in part).

CYATHEA ALPINA, *Smith*, *Mémoires de l'Académie Royale des Sciences de Turin*, v. 417 (in obs.). *Roth*, *Flora Germanica*, iii. 103.

[illegible] REGIA, *Smith*, *English Flora*, iv. 289 (excl. syn. Withering, and the alpine habitats).

CYSTEA ALPINA, *Smith*, *English Flora*, v. 291 (in [illegible]).

ATHYRIUM ALPINUM, *Sprengel*, "*Crypt.* 33."

ATHYRIUM [illegible], *Gray*, *British Plants*, [illegible] (excl. syn. Withering).

CYSTOPTERIS [illegible], *Gray*, *British Plants*, [illegible].

EXPLANATION OF THE PLATE.

PLATE XL[illegible] [illegible] [illegible] ALPINA, cultivated. *Dr. Allchin*.

HABITAT. The only authenticated habitat for this plant is a wall at Low Leyton, in Essex, where at the close of the last century it existed in such great plenty as to forbid the notion of its being, at that early date, an introduced species. The plant is now nearly destroyed by repairs, though it exists in more than one station in the neighbourhood. Specimens have been received from Mr. Shepherd, said to have been gathered in Derbyshire and Yorkshire, but without more particular habitats assigned. The various alpine stations which have been reported for this plant probably belong rather to small, much-divided forms of *C. fragilis*. We have not seen a mountain specimen of *C. regia*, unless it be one from Saddleback, in Cumberland, gathered many years since by Mr. S. F. Gray.

GEOGRAPHICAL DISTRIBUTION. This elegant plant is plentiful in many localities in the Alps of Switzerland, Carinthia, Styria, &c. [illegible] found also on the Pyrenees, on Mount Taygetus, in the Morea, and on Mount Taurus (*Sir W. J. Hooker*).

Caudex short, decumbent, spreading, tufted, the crown sparingly furnished with a few very narrow pale brown *scales*. *Fronds* numerous, branched, [illegible].

Stipes variable in length, sometimes quite short, sometimes one-third to one-half the length of the

from pale coloured except at the base which is brownish, brittle, slender, terminal and adherent to the caudex. *Stipes* and *rachis* narrow [illegible]

Venation [illegible]

Fronds [illegible] six or eight inches long, [illegible] smooth [illegible] bipinnate, or almost tripinnate in luxuriant fronds. *Pinnæ* ovate, acute, unequal. *Pinnules* bluntly or sometimes acutely ovate, with a narrow stalk-like attachment, deeply pinnatifid, the lobes linear or linear-oblong, blunt, obscurely toothed, or sometimes with short distinct erect teeth which are blunt, pointed or retuse. In the larger pinnules the lobes, though still decurrent, and not truly separate, are distant and almost divided to the rachis, producing almost a tripinnate mode of division.

Venation of the pinnules consisting of a straightish midvein, with alternate lateral branches (*veins*) directed into each lobe, and there again branching into several *venules*, which terminate in the retuse apices of the teeth, and are thus apparently directed towards the marginal sinuses.

Fructification scattered over the back of the frond. *Sori* numerous, sometimes crowded, small, round, medial on the veins, indusiate. *Indusium* a small delicate transparent membrane, which is ovate acute, slightly jagged in front, attached behind the sori, projected forwards over them, and at length reflexed. *Spore-cases* roundish-obovate. *Spores* oblong, echinate.

Duration. The caudex is perennial. The fronds are annual, appearing in May and perishing in autumn.

As the plant found at Leyton is generally admitted to be the *Polypodium regium* of Linnæus, while it is certainly also the *P. alpinum* of Wulfen, it seems proper to adopt, as Presl has done, the older specific name. Linnæus's specimen, however, it must be observed, is unsatisfactory as evidence in support of this view.

There is no doubt the plant is distinct from *C. fragilis*, being analogous in size with the smaller forms of that species, but more finely divided. The segments of its pinnules are either narrow-oblong or linear, and the teeth are either blunt or more commonly emarginate, the veins very frequently terminating in the notch at the apex of the tooth, instead of at the projecting point of the tooth, as in *C. fragilis*.

It is an easily grown plant, either in well-drained pots of free open soil, such as light loam and turfy peat with sand; or in good, *i. e.* sheltered situations well drained, and with congenial soil, in open rockeries. It is more liable than the allied plants to suffer from damp while at rest in winter, and hence should not be too much watered at that season. There is no other difficulty in cultivating it, and it is increased with facility by division.

The plants occasionally produce forked fronds, but there is no permanent variety known.

PLATE XLVI. c.

THE MOUNTAIN BLADDER FERN

(CYSTOPTERIS MONTANA).

CYSTOPTERIS, *Bernhardi*

Clusters of Spore-cases rotundate growing from the back of the veins, medial, indusiate. *Indusium* hooded or cucullate, fixed by its broad base posteriorly beneath the sorus, and inflected over it, at length reflected, the free (anterior) margin truncate acute or acuminate, often fringed. *Veins* disunited at their extremities, branched, the branches (*venules*) simple or forked.

C. MONTANA: fronds triangular tripinnate below, [illegible] spreading, pinnules ovate or oblong, neiso-dentate or pinnatifid, the lobes obtusely subfalcate, toothed at the apex, candex creeping.

CYSTOPTERIS MONTANA, *Bernhardi, Schrader's Neues Journal für die Botanik*, 1806, part 2, 20. *Link, Hortus Regiae Berolinensis*, [illegible] *Filicum Species*, [illegible] *Presl, Tentamen Pteridographiae*, 93. *Hooker, Species Filicum*, 200. *Hooker and Arnott, British Flora*, 672. *Deakin, Floregraphia Britannica*, [illegible] *Newman, History of British Ferns*, 2 ed., 153. *Babington, Manual of British Botany*, 443. *Moore, Handbook of British Ferns*, 80. *Sowerby, Ferns of Great Britain*, 41 [illegible] *Fee, Genera Filicum*, 200.

CYSTOPTERIS ALLIONI, *Newman, Appendix to Phytologist*, 1851, xxx.

CYSTOPTERIS MYRRHIDIFOLIA, *Newman, History of British Ferns*, 3 ed., 97.

POLYPODIUM MONTANUM, *Lamarck, Flore Française*, [illegible] *Allioni, Flora Pedemontana*, ii. 287 ([illegible]). *Hoeke, Jacquin's Collectanea*, ii. 41.

POLYPODIUM MYRRHIDIFOLIUM, *Villars, Flora Delphinalis*, 14 ([illegible] 85. *Histoire des Plantes du Dauphiné*, [illegible] 1786), ii. 85, [illegible] 53 [illegible]

ASPIDIUM MONTANUM, *Swartz, Schrader's Journal für die Botanik*, 1800, ii. 12. *Synopsis Filicum*, 61. *Schkuhr, Kryptogamische Gewächse*, [illegible] *Willdenow, Species Plantarum*, v. 240. *Sprengel, Systema Vegetabilium*, [illegible] 99.

ATHYRIUM MONTANUM, *Rochling, Deutschlands Flora*.

CYATHEA MONTANA, *Smith, Mémoires de l'Académie Royale des Sciences de Turin*, v. 417. *Roth, Flora Germanica*, iii. 400.

EXPLANATION OF THE PLATE.

PLATE XLVI. c. CYSTOPTERIS MONTANA. 1. from Pantochen, Forfarshire. *J. Backhouse*. 2. from Glen Lochay, Perthshire. *G. Maw*. 3. Gemmiferous Lochlar in Glen Lochay (cultivated). *A. Tait*.

HABITAT.—This species was first found in Great Britain, by Mr. W. Wilson, in 1830, on Ben Lawers in Perthshire. It was subsequently met with by Mr. W. Jourdie, Dr. Arnott, Mr. Borrer, R. W. Little, Mr. Westcombe and others on the mountains dividing Glen Lochay and Glen Dochart, in the same county. Recently it has been gathered in the same districts by Dr. Balfour, and Mr. G. Maw, and in Glen Isla, Clova, Forfarshire, by Mr. J. Backhouse, to all of whom we are indebted for specimens. It is further recorded in the *Naturalist* as having been found, in 1855, on Benchinnes (Fitzbrandon) mountain of Banffshire.

GEOGRAPHICAL DISTRIBUTION. This Fern is found in the extreme north of Europe, and is hence scattered more and there southwards to Spain, Italy and Hungary. According to Gelebour it is met with in Kamtchatka. It is also found on the Rocky mountains of north-west America.

Rhizome creeping, about as thick as a crow's quill, producing the fronds at intervals, almost black with a few scattered ovate *scales* on the younger portions. *Fibres* branched rigid.

Stipes lateral and adherent to the rhizome, slender, longer than the frond, often twice as long, dark-brownish-purple at the base, paler upwards, sparingly furnished, especially near the base, with ovate-lanceolate scales. *Rachis* narrowly margined above, and together with the secondary rachides, which are also margined, sometimes tinged with purple.

Vernation circinate.

Fronds four to twelve inches high including the stipes, the leafy portion being about three or four inches long, and the same in breadth, herbaceous, deep-green, smooth, triangular tripinnate. *Pinnae*

unequal ascending, the lower pair considerably largest, two inches and a half long, obliquely ovate the posterior pinnules twice as long as the anterior ones; some of the other pinnæ are also unequal-sided, the posterior pinnules being largest, but at the top this difference is not manifest. *Pinnules* (the larger posterior ones) ovate, pinnate, or the smaller upper ones pinnatifid. *Pinnulets* (basal) of the larger pinnules, ovate with a distinct narrowed stalk-like attachment, but connected by a narrow wing, pinnatifid, with oblong-ovate obtuse lobes cut into linear teeth which are generally bifid at the extremity. In its ultimate divisions it is thus very much like *C. regia*.

Venation of the pinnules, consisting of a nearly straight midvein, with alternate *veins* directed one into each lobe; a *venule* is given off towards the teeth, and is continued to the margin, where it is lost in the sinus formed by the bifid apex of the tooth, thus ending in a depression rather than a projection of the margin.

Fructification occupying the whole under surface. *Sori* consisting of numerous moderate sized roundish masses of spore cases, medial on the veins, indusiate. *Indusium* [illegible] ovate transparent, concave, subrotund membrane, irregular at the margin, placed at the back of the sorus, and soon obliterated. *Spore-cases* obovate. *Spores* oblong [illegible].

Duration. The rhizome is perennial. The fronds are annual, and appear about May, perishing [illegible].

This plant is at once known from the other British species of *Cystopteris* by its long creeping rhizome, and its triangular and tripinnate fragile fronds. It has much more the aspect of *Polypodium Dryopteris*, for which it might, perhaps, be mistaken—the more readily, as its indusia become soon obliterated, and the sori then seem to consist of round naked masses of spore-cases. It is, however, not three-branched as that is, and is more divided.

This plant has hitherto proved difficult to cultivate, probably on account of the slight information which was possessed of the peculiarities of its native habitats. Now however that it is known that its rhizomes thread their way on the ledges of dripping rocks, among beds of sphagnum, it may be supposed that less difficulty will be experienced. These natural conditions suggest the employment of (1,) broad shallow vessels, (2,) a very open medium for the roots, such as light turfy peat and sphagnum intermixed and blended with sand, and (3,) constantly abundant, yet not stagnant, moisture. The creeping rhizomes afford every facility for propagation.

Plate XLVII a

THE OBLONG WOODSIA (Woodsia ilvensis).

WOODSIA, *R. Brown*

Clusters of Spore-cases [illegible] medial, [illegible] from the back of the veinlets. *Indusium* attached [illegible] the spore-cases [illegible] and [illegible] at the margin into [illegible] capillary [illegible] segments, which are incurved over the spore-cases. [illegible] *veinlets* simple or forked.

W. ilvensis: fronds oblong lanceolate [illegible] with [illegible] broadly [illegible] chaffy scales beneath; pinnae oblong [illegible] pinnatifid, with bluntly ovate, or oblong obtuse lobes; [illegible]

Woodsia ilvensis, *R. Brown*, [illegible] *Smith*, [illegible] *Flora* [illegible] *Supplement to English Botany*, [illegible] *Flora* [illegible] *Hooker and Arnott*, *British Flora*, [illegible] *Manual of British Botany*, [illegible] *Ferns of Great Britain*, [illegible] *History of British Ferns*, [illegible] *Handbook of British Ferns*, 60. *Sprengel*, *Systema Vegetabilium*, [illegible] *Filicum* [illegible]
Woodsia [illegible], *Sprengel*, [illegible] according to [illegible]
Woodsia [illegible], *Newman*, *History of British Ferns*, [illegible]
Woodsia [illegible], *Beck*, according to [illegible]
Acrostichum [illegible], *Linnaeus*, *Species Plantarum*, [illegible] *Flora Britannica*, [illegible]
Acrostichum [illegible], *Haenke* in *Jacquin's Collectanea*, [illegible]
Polypodium [illegible], *Histoire des Plantes du Dauphiné*, [illegible] *Roth*, *Catalecta Botanica*, [illegible] *Schrader's Journal für die Botanik*, [illegible] *Synopsis Filicum*, [illegible] *Willdenow*, *Species Plantarum*, [illegible] *Presl*, *Tentamen Pteridographiae*, [illegible]
Polystichum? [illegible] *Flora*, [illegible]
Aspidium [illegible], *Swartz*, *Synopsis Filicum*, [illegible] *Systema Plantarum*, [illegible]
Nephrodium [illegible], *Michaux*, *Flora Boreali-Americana*, [illegible]
Aspidium [illegible], *Appendix* of *Flora* [illegible]
Polypodium [illegible], *British Plants*, [illegible] *Smith*
[illegible], *Presl*, *Tentamen Pteridographiae*, [illegible]

EXPLANATION OF THE PLATE.

Plate XLVII a. Woodsia ilvensis [illegible] from Westmoreland, *F. Clowes*; [illegible] from Forfar, *Herb.* [illegible] *Gray*. 3 cultivated, *The Author*.

HABITAT: [illegible] one of our rarest Ferns, occurring in [illegible] of moist rocks in limited quantity and in few and distant stations, among the mountains of Scotland, Wales and the north of England, ranging in elevation probably from 800–2000 feet or thereabouts. [illegible] Clova Mountains [illegible] and [illegible] reported from [illegible] with specimens from [illegible] counties of Dumfries, Peebles and Selkirk. [illegible] recently found it in Westmoreland, and it [illegible] found near [illegible] in Cumberland. [illegible] Wales it is met with [illegible] Caernarvon [illegible]

GEOGRAPHICAL DISTRIBUTION: This Fern is more abundant [illegible] north of Europe [illegible] found in Iceland, Lapland, Norway, Sweden, and Russia, whence [illegible] through Denmark, Germany, Hungary, Switzerland, and France [illegible] and Spain. [illegible] Mountains [illegible] and Anderson's Bay (*Hb. Hooker*). [illegible] found in North America about the Saskatchewan [illegible] Rocky Mountains [illegible] *Lindley* and *Hooker*, [illegible] and in the United States.

Caudex short, oblong or sub-globose, forming a small, erect or [illegible] tufted crown, furnished with a few scales above. *Scales* lanceolate [illegible] or subulate, pale brown. *Fibres* dark brown, [illegible] branched, slightly hairy.

Stipes pale brown, with a [illegible] from one to two [illegible] long, articulated above the [illegible] which is terminal [illegible] the rachis with [illegible] pale [illegible]

Vernation circinate, the young fronds [illegible] like a shepherd's crook.

Fronds from two to four or six inches long terminal on the caudex, [illegible] membranaceous, dull deep [illegible], more or less rusty beneath from the abundant scales, lanceolate oblong pinnate. *Pinnæ* [illegible] and spreading or nearly horizontal the larger ones about an inch, the smaller half an inch in length. *Lobes* eight to twelve, oblong obtuse, the basal ones largest, their margins obscurely crenate, and as well as the upper surface furnished with coarse scattered hairs, in addition to which on the under surface [illegible]

[illegible] consisting of a flexuous and not very distinct midvein, from which arise alternate *veins*, the lower ones usually forked some distance from their base, the *venules* extending quite free nearly to the margin, and bearing the sori near the apex, but below it, the upper veins, which [illegible]

Fructification on the back of the frond, scattered nearly equally over the whole surface, situated below the apex of the veins and venules sometimes copious and becoming confluent. *Sori* circular [illegible] is fringed with jointed spring hairs, which curve inwards, involving the spore-cases, hence they are involucrate. *Spore-cases* roundish-obovate *Spores* oblong, roundish, or irregularly three-cornered [illegible]

Duration. The caudex is perennial The fronds are annual, growing up in spring, about March and [illegible]

The chief peculiarity of the genus to which this species is referred, is found in the peculiar investing membrane which covers the sori, and which is not easy of examination without careful manipulation. It consists, in fact, of a small concave scale, resting on the vein beneath the sorus, having its margin fringed with numerous hair-like segments [illegible] over the spore-cases. This structure gradually merges through some exotic species into an undivided bladdery cup, containing the spore-cases, so that *Woodsia*, in this comprehensive sense, forms the passage from the polypodiaceous to the cyathaceous [illegible]

Woodsia ilvensis differs from *W. alpina* in the breadth and development of the frond, which is lanceolate and not linear, and it has elongated oblong not short deltoid pinnæ. It differs further in the [illegible] condition of the stipes and rachis, and of the lower surface of the ribs and veins of the frond, *W. alpina* being almost destitute of subulate scales, although sparingly furnished with [illegible] jointed hairs. Mr Wollaston [illegible] to us a further difference, namely, that at the period of vernation whilst *W. ilvensis* shows no trace whatever of its fructification, the sori in *W. alpina* are remarkably conspicuous. That they are quite distinct, seems to be the general opinion of botanists.

This species, according to Mr Wollaston's observations, produces one variety—*multifida*—in which the apex of the frond, and occasionally the apices of the lobes, are [illegible]

NATURE PRINTING.

A. Woodsia ilvensis. B. W. alpina

PLATE XLVII. B

THE ALPINE OR DELTOID WOODSIA (WOODSIA ALPINA).

WOODSIA, *R. Brown.*

Clusters of Spore-cases circular, [illegible] medial, springing from the back of the [illegible]. *Involucre* [illegible] beneath the spore-cases, hence inferior, and divided at the margin into numerous capillary-jointed segments, which are incurved over the spore-cases. *Veins* [illegible] at their extremities. *Venules* simple or forked.

W. ALPINA; fronds linear pinnate, slightly hairy, not scaly; pinnæ triangular, or triangular-ovate, obtuse, pinnatifid or lobed; the lobes roundish obovate, nearly or quite entire; [illegible] and rachis very slightly hairy.

[illegible] *Gray, Natural Arrangement of British Plants* [illegible] in part. [illegible] *Naturalist's* [illegible] *British Ferns*, [illegible] *Pteridographia Britannica*, [illegible]

W[illegible] *Babington, Manual of British Botany* [illegible]

Woodsia [illegible] *R. Brown, Transactions of the Linnæan Society* [illegible] *Smith, English Flora*, [illegible] *Hooker and Arnott, British Flora* [illegible] *Handbook of British Ferns* [illegible] *Genera of Ferns* [illegible]

[illegible] *Bolton, Filices Britannicæ*, [illegible]

[illegible] *Liljeblad, Stockholm Transactions*, [illegible]

[illegible] *Swartz, Synopsis Filicum* [illegible] *Smith, English Botany* [illegible] *Kryptogamische Gewächse* [illegible] *Willdenow, Species Plantarum* [illegible] *Presl, Tentamen Pteridographiæ* [illegible]

[illegible] *Withering, Arrangement of British Plants* [illegible]

[illegible] *Flora* [illegible]

Polypodium [illegible] *Smith, Flora Britannica*, [illegible]

Polypodium [illegible] *Linnæus, in Herb.*

EXPLANATION OF THE PLATE.

PLATE X[illegible] WOODSIA ALPINA [illegible] from Cruell [illegible] *Botanic Garden* [illegible] 2 from the [illegible] *Alps of* [illegible] from [illegible] Perthshire. *R. M. Stark*.

HABITAT. This species is still more, if possible, than the *Woodsia ilvensis*. Its head-quarters are the mountains of Perthshire, and it is said to grow in Glen Fiadh, in Forfarshire. The reported habitat of the Moffat Hills in Dumfriesshire is not clearly referred to this species. Besides these Scotch localities, the rocky precipices of Snowdon, in Carnarvonshire, are the only places in which it is known to grow naturally within the United Kingdom.

GEOGRAPHICAL RANGE. Of the countries of Europe, the Fern has been found in Lapland, Norway, Sweden, Russia, Germany, Hungary, Switzerland, France, and Spain, besides Great Britain. In Asia it occurs in Siberia, in the region of Lake Baikal, as well as in [illegible] on the [illegible] slopes of the Himalaya (*Hk. Hook.*). In America it is found on the Mountains of Massachusetts, in Saskatchewan, and in the Rocky Mountains. In the same regions about [illegible], [illegible] the [illegible] *Woodsia glabella* [illegible] Brown, which has [illegible], small [illegible] specific marks, and is rather to be considered as a somewhat more [illegible] state of *W. alpina*, in which the few hairs of the latter [illegible] the scales of the [illegible] *W. alpina* [illegible]

Caudex short, subglobose or oblong, forming a small erect or decumbent crown, furnished with a few scales above. *Scales* lanceolate, pale brown. *Fibres* dark brown, wiry, smooth, branched.

Stipes pale reddish-brown, from three-fourths of an inch to two inches long, articulated at about one-third of its length from the base, which is persistent, sparingly furnished with subulate, pale-brown membranaceous scales. *Rachis* slightly coloured, and very sparingly furnished with pale narrow [illegible] scales.

Vernation circinate.

Fronds from about one and a half to six inches long, terminated [illegible] the [illegible] membranaceous, of a tender green, linear [illegible], pinnate. *Pinnæ* not rarely sub-opposite, more frequently alternate, triangular-ovate, obtuse, sessile or very shortly stalked, pinnatifid; the lower ones distant, the distance varying from three-eighths of an inch in the smaller plants to three-fourths of an inch in more vigorous ones, the pinnæ about one-fourth of an inch long in medium-sized specimens, up to about half an inch

in the larger ones, the upper ones more closely placed, and semi-patent or nearly horizontal. *Lobes* five to seven, roundish obovate, largest at the base, the lowermost sometimes divided nearly to the midvein, the upper ones [illegible] decurrent, and the apex, in the most vigorous specimens, notched so as to indicate [illegible] entire or obscurely crenate, furnished with a few scattered tubular jointed hairs, and [illegible] the [illegible] surface.

Venation of the lobes consisting of a flexuose indistinct midvein which is alternately branched, the branches or *veins* are forked, rarely more than once, the upper ones undivided; both veins and *venules* terminate [illegible] slightly [illegible] point. The [illegible] of the forked [illegible]

Fructification on the back of the frond, produced on all parts of the frond, but somewhat [illegible] copiously in the upper part, the sori situated below the apex of the venules, hence medial, and often at length confluent over the lobes. *Sori* circular, seated [illegible], that is above a small membranaceous scale, whose margin is fringed with jointed hairs which curve inwards involving the spore-cases, hence they are involucrate. *Spore-cases* roundish-obovate. *Spores* brown, round or roundish-oblong, the surface granulated or [illegible].

Duration. The caudex is perennial. The fronds are annual, growing up in spring and perishing [illegible]

The description above given of this very rare species has been drawn up from a series of remarkably fine specimens, collected on the Breadalbane mountains in Perthshire, by Mr J. T. Syme. No [illegible] one would think need be more distinct than this from *Woodsia ilvensis*, from which the eye once acquainted with it, readily dissociates it. It is a smaller, narrower and smoother-looking plant than that species; and though under the excitement of the artificial conditions imposed on it in a state of culture, it does sometimes seem to acquire greater breadth and leafiness, so to speak, than is observable in the wild specimens, yet the proportion and general features of the plant remain unchanged. It is much more like to *W. glabella*, a native of North-West America, but that is still more narrow and slender.

Our own experience of the cultivation of the *Woodsias* is given in the *Handbook of British Ferns* (p. 70) from which we quote the following:

The *Woodsias* are best cultivated in moderate-sized well-drained pots, kept in a cold frame, facing the north during the summer-season, and should not be kept constantly closed up. They are very impatient of sunshine and stagnant moisture. The crown of the plants may in potting be advantageously elevated a little between two or three small pieces of sandstone. They must not be kept too damp, especially during winter. A shady shelf in a cool greenhouse where there is a free circulation of air, or a dryish cold frame, are good situations in which to preserve them during the dormant season. When it becomes necessary to divide the tufts, which is the most ready means of propagation, it should be done very carefully in spring about the time they commence their seasonal growth. In obtaining plants from their wild habitats for the purpose of cultivation, as with most other of the rare Ferns, it is found that small plants are much more successfully transplanted than the larger and older masses.

Mr Newman recommends potting with [illegible] of porous stone placed vertically as high as the pot, the roots to be carefully arranged among the central pieces, and then covered with a finely-sifted mixture of decayed leaf-mould, silver sand, and peat, used nearly dry, shaken down and watered, the process being repeated, if necessary, until the interstices are filled up. We should prefer to use [illegible] light loam and sand between the [illegible] and this coincides with the experience of Mr Wollaston. Mr Backhouse [illegible] that the less repotting or disturbance at the root they are subjected to, after being once planted, the better.

PLATE XLVIII.

THE EUROPEAN BRISTLE FERN (TRICHOMANES RADICANS).

TRICHOMANES, *Linnæus*.

Clusters of Spore-cases enclosed within extra-marginal tubular or urn-shaped *involucres*, which are of the same texture as the frond. *Spore-cases* obliquely compressed, with a transverse ring, sessile around the base of the columnar receptacles [illegible] vertically. *Receptacles* (extra-marginal extensions of the veins) free within the involucres, [illegible] form, more or less exserted. *Veins* [illegible] at their extremities, simple or forked.

T. RADICANS; fronds pellucido-membranaceous, ovate-lanceolate, or triangular-ovate, tri-quadri-pinnatifid; the rachis everywhere, and the upper part, or the whole, of the stipes winged; ultimate segments linear, entire or obtusely bifid; involucres cylindrical, scarcely two-lipped, solitary in the axils of the upper segments, more or less margined or winged; caudex long, creeping, tomentose.

TRICHOMANES RADICANS, *Swartz, Flora Indiæ Occidentalis*, iii. 1736. *Synopsis Filicum*, 143. *Willdenow, Species Plantarum*, v. [illegible]. *Hooker, Species Filicum*, 125 [illegible]. *Babington, Manual of British Botany*, [illegible]. *Moore, Handbook of British Ferns*, [illegible]. *Newman, History of British Ferns*, [illegible]. *Sowerby, Ferns of Great Britain*, 72, 45. *Sprengel, Systema Vegetabilium*, iv. [illegible]. *Presl, Hymenophyllaceæ*, [illegible].

TRICHOMANES [illegible]. *Willdenow, Species Plantarum*, v. [illegible]. *Sprengel, Systema Vegetabilium*, iv. [illegible]. *Presl, Hymenophyllaceæ*, [illegible]. *Newman, History of British Ferns*, 2 ed. [illegible].

TRICHOMANES [illegible]. *Smith, Rees' Cyclopædia*, Art. *Trichomanes*.

TRICHOMANES [illegible]. *Sprengel, Systema Vegetabilium*, iv. 130.

TRICHOMANES [illegible]. *R. Brown, Hortus Kewensis*, ed. 2, v. [illegible]. *Smith, English Flora*, iv. [illegible]. *Presl, Hymenophyllaceæ*, [illegible]. *Mackay, Flora Hibernica*, [illegible].

TRICHOMANES [illegible]. *R. Brown, Prodromus Floræ Novæ Hollandiæ*, [illegible]. *Hooker, Flora Londinensis*, [illegible].

TRICHOMANES [illegible]. *Hudson, Flora Anglica*, [illegible]. *Bolton, Filices Britannicæ*, [illegible], 30.

TRICHOMANES [illegible]. *[illegible] Catalogue*, [illegible].

TRICHOMANES [illegible]. [illegible].

TRICHOMANES [illegible]. *Humboldt, Bonpland et Kunth, Nova Genera Plantarum*, [illegible], according to Sprengel.

TRICHOMANES [illegible]. *Weber, Synopsis Filicum*, [illegible], according to Hooker.

HYMENOPHYLLUM [illegible]. *Smith, English Botany*, [illegible]. *Willdenow, Species Plantarum*, v. [illegible].

HYMENOPHYLLUM [illegible]. *Smith, Flora Britannica*, [illegible].

TRICHOMANES [illegible], according to Hooker.

Var. ANDREWSII, fronds narrow lanceolate-ovate; primary divisions narrow and, as well as the secondary, distant; involucres immersed; receptacles much elongated.

TRICHOMANES RADICANS, *var.* ANDREWSII, *Moore, Handbook of British Ferns*, ed. 1, 30. *Newman, History of British Ferns*, 3 ed. 322, with a figure.

TRICHOMANES [illegible] ANDREWSII, [illegible] *British Ferns*, [illegible].

TRICHOMANES ANDREWSII, *Newman, British Ferns*, [illegible].

TRICHOMANES [illegible] ANDREWSII, *Hepfrey, Francis's Analysis of British Ferns*, [illegible].

EXPLANATION OF THE PLATE.

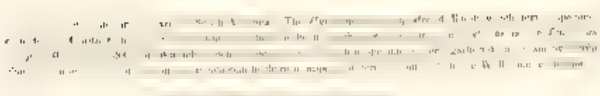
PLATE X[illegible]. **A,** TRICHOMANES RADICANS, from Killarney, [illegible]. **B,** [illegible] Killarney, [illegible]. **C,** TRICHOMANES RADICANS *var.* ANDREWSII, from the south-west of Ireland. *W. Andrews*.

HABITAT. The Trichomanes is not now found in England, though it formerly grew at Bell Bank, near Bingley, Yorkshire, where [illegible] who [illegible] figured it, states it was growing [illegible]. Its present habitats are confined to the south-west of Ireland, where in the rocky glens, caves, and [illegible] of the counties of Cork, Kerry and Wicklow, [illegible] and [illegible] sometimes in a most luxuriant condition. [illegible] Turk mountain, Killarney, [illegible] the most [illegible] specimens [illegible] to Mr. D. Moore [illegible] Mr. W. Andrews for magnificent specimens, [illegible].

GEOGRAPHICAL DISTRIBUTION. [illegible] by the present northern limit of Ireland, this Fern is again met with [illegible] in the African islands of the Atlantic Ocean, [illegible] Madeira and the Azores [illegible] found in Nepal and Sikkim, where it [illegible], also [illegible] along [illegible] Mergui, in the East Indies [illegible] the West Indies, Jamaica, Martinique [illegible] small slender form [illegible] Mexico, Panama, New [illegible], Venezuela, large and much divided [illegible] Brazil [illegible] the Society Isles. A variety with [illegible] fronds and a [illegible] involucre is found in Brazil, Ecuador, Mexico, and the Sandwich Isles, [illegible] other forms [illegible].

THE EUROPEAN BRISTLE FERN

[illegible]



Rhizome black, creeping, elongated, tomentose, with small thick-set articulated dark-coloured jointed hairs. *Fibres* black, stout, branched, densely tomentose.

Stipes varied [illegible] from one-fourth to one-half the entire length of the frond, terete, margined [illegible] is wing, which is sometimes continued nearly to the base, lateral adherent to the rhizome, the base clothed with articulated hairs. *Rachis* everywhere winged.

Venation circinate.

Fronds six to twelve inches or more in length, pellucido-membranaceous, dark olive-green, darker when dry, quite smooth, ovate-lanceolate, or triangular-ovate, more or less attenuated at the apex, tripinnatifid, or quadripinnatifid. *Primary divisions* (pinnæ-like segments) ovate-lanceolate, the secondary ones ovate obtuse, cuneate at the base, the tertiary ones oblique oblong, the ultimate lobes oblong, toothed, the teeth short linear, entire, emarginate, or bifid. In highly developed fronds of the triangular form the secondary divisions are often longer and comparatively narrower, and the ultimate divisions are more distant. The teeth at the apices of each series of divisions are frequently more elongated.

Venation consisting of a series of forked ramifications of the wiry ribs, which issue alternately from the main rachis and enter the primary divisions; these are everywhere bordered with a pellucid wing of a loosely cellular texture. The lowest anterior branch or veinlet of these veins in the ultimate segments is, in the fertile fronds, continued beyond the margin and forms the receptacle, but in the barren portions the apices of the veinlets do not quite reach the margin.

Fructification scattered over the fronds, extra-marginal, i.e. the tubular involucres are projected outwards from the margin, the opening being exterior. *Sori* consisting of sessile spore-cases, clustered around the base of the filiform receptacle, which is free within the involucre, with its apex more or less projected beyond it. *Involucre* cylindrical, cup-shaped, somewhat tapering below, open exteriorly, supra-axillary, that is, produced in the upper axils of the (ultimate) lobes, more or less sunk in the apex of one of the lobes or teeth, the mouth sometimes slightly spreading, or shortly two-lipped. *Spore-cases* sessile, oblique, latero-vertically compressed, roundish or obovate. *Spores* irregularly roundish or oblong, sometimes three-cornered minutely papillose.

Duration. The rhizome is perennial. The fronds are also persistent, enduring for many years if not injured; they are at least two years arriving at the fertile state.

The pellucid moderate-sized, much divided yet not pinnated fronds of this species, produced from a creeping rhizome, suffice to distinguish this plant from other British Ferns. There are at least three forms or states of it met with in Ireland. One in which the fronds are ovate-lanceolate, with the segments broader (PLATE XLVIII. A.) most nearly according with *T. radicans* of Swartz, as illustrated by Hedwig. Another more triangular in outline, the segments appearing narrower (PLATE XLVIII. B.), seems to represent the *T. speciosum* of Willdenow. A third with the fronds narrower and more lanceolate, the primary divisions narrow and, as well as the secondary ones, more distant or distinct (PLATE XLVIII. C.), is the *T. Andrewsii* of Newman and is analogous to many of the tropical forms.

In cultivation this Fern requires that its rhizome should be fixed to a firm and durable medium for which such materials as porous stone, or earthenware, or brick are most suitable, and this must be kept constantly moist with trickling water. The rhizome then, as it grows, attaches itself in the manner of ivy. To induce this growth of the rhizome and also a healthy growth of the fronds, a constantly damp atmosphere is essential; indeed the fronds themselves should be almost constantly in a dripping state and always [illegible]

Trichomanes radicans.

NATURE PRINTING.

Plate XLIX. a

THE TUNBRIDGE FILM FERN
(Hymenophyllum tunbridgense).

HYMENOPHYLLUM, *Smith*

Clusters of Spore-cases enclosed within extra-marginal two-valved sub-urceolate involucres, of the same [illegible] the frond. *Spore-cases* obliquely compressed with a transverse ring, sessile around the columnar receptacles, bursting vertically. *Receptacles* (extra-marginal extensions of the veins) free, and included within the involucres, sub-clavate. *Veins* dilated at their extremities, simple or forked.

H. tunbridgense: fronds pellucido-membranaceous, ovate or oblong more or less elongated, pinnate; pinnæ subvertical, pinnatifid, decurrent, forming a wing to the rachis; segments linear, undivided or bifid, and, as well as the upper margin of the roundish valves of the axillary solitary sessile compressed involucres, spinulosely serrate.

Hymenophyllum tunbridgense, Smith, Mémoires de l'Académie Royale des Sciences de Turin, [illegible] English Botany [illegible] English Flora [illegible] Hooker, Species Filicum [illegible] British Ferns [illegible] Babington, Manual of British Botany [illegible] Mackay, Flora Hibernica [illegible] Phytologist [illegible] Smith, History of British Ferns [illegible] Moore, Handbook of British Ferns [illegible] [illegible]

Hymenophyllum [illegible]

Trichomanes [illegible] Linnæus, Species Plantarum [illegible]

Trichomanes [illegible] Withering, [illegible]

EXPLANATION OF THE PLATE.

Plate XLIX. a. Trichomanes [illegible] from Killarney [illegible]

HABITAT. The Tunbridge Film Fern is found in mountainous and rocky situations, usually [illegible] [illegible] Somerset [illegible] Sussex [illegible] Kent [illegible] Lancaster and York [illegible] Stirling, Perth [illegible] Connaught [illegible] Munster [illegible] Killarney [illegible] ranges from [illegible] an elevation of about [illegible] feet.

GEOGRAPHICAL DISTRIBUTION. This species occurs in the greater part of [illegible] France, Germany and Italy [illegible] India [illegible] New Zealand [illegible] Tasmania and New Holland [illegible] Brazil [illegible]

Rhizome rigid, filiform, dark-brown, creeping, branched, and forming dense entangled carpet-like masses, furnished about the base of the fronds with a few hair-like scales. *Fibres* slender and downy.

Stipes slender, wiry, terete, varying from one-third to one-half the length of the frond, often slightly margined or winged in the upper part, lateral at intervals along the rhizome to which it is adherent. *Rachis* winged.

Venation [illegible]

Fronds smooth, pellucid-membranaceous, minutely cellular, deep-olive or sometimes brightish green from [illegible] four or five inches long, varying in outline, usually ovate, lanceolate-ovate, or oblong, more or less [illegible] *Pinnæ* or primary divisions [illegible] so as to form [illegible] except at the base of the larger fronds, a narrow entire wing to the rachis; distinctly ascending [illegible] in circumscription; furcately bipinnatifid, that is to say twice divided with the ramifications on a dichotomous or forked plan, the divisions alternating, and so placed as to show an apparent excess of development on the anterior side from the medial or axial vein (which may be recognised), curving upwards. *Ultimate segments* linear-obtuse, spinulosely serrate.

Venation consisting of a series of dichotomous ramifications (two or three-times repeated) of the wiry ribs which branch alternately from the main rachis, each ultimate segment having one of these divisions along its centre, and not quite reaching to its apex. Thus the fronds might be said to consist of slender branching wiry ribs everywhere bordered with a delicately cellular pellucid membranaceous margin.

Fructification usually produced in the upper half of the fronds, extra-marginal, *i. e.* the two valved involucres are projected outwards from the margin, the opening being exterior. *Sori* consisting of sessile spore-cases clustered around the receptacle. *Receptacle* formed of the altered apex of the lowest anterior vein of the pinna, spongy, oblong-clavate, free, central and shorter than the valves of the involucre, therefore included. *Involucres* sessile, supra-axillary, *i. e.* borne in the axils of the pinnæ or primary divisions, short, compressed, the base somewhat inflated, cuneate and more or less sunk in the segment; the anterior part two-valved, the valves semiorbicular, flattish, spinulosely serrate at the upper margin. *Spore-cases* sessile, affixed obliquely, vertically compressed, thus lenticular, with a transverse ring. *Spores* minute, irregularly oblong, or triangular. Normally the lower anterior branch of the pinnæ only is fertile, but sometimes one or more others are also soriferous.

Duration. The rhizome is perennial. The fronds are also perennial, growing up in the course of the summer, attaining their full growth during the season, but enduring two or three years under favourable circumstances.

The two British *Hymenophyllums*, may be known from other Ferns by the matted growth of their thread-like rhizomes, by the small size, the pellucid, and finely cellular texture of their fronds, whose segments have each only a central rib, and by the two-valved marginal fructifications. They may be best known from each other by the form of the involucres and of their valves; for although they may probably always be recognised by a practised eye by their peculiarities of growth, yet these latter are not features to be generally depended on. In *H. tunbridgense* the valves of the involucre are roundish and flattish, and the upper margin is spinulosely serrate, like the margin of the segments of the pinnæ; whilst in *H. unilaterale* the valves are ovate and convex, and the margin is quite even. In the former the involucres are usually sessile and erect; in the latter stalked and deflexed in an opposite direction to the segments. No varieties of importance have been observed in the British *Hymenophyllums*.

NATURE PRINTING.

A. Hymenophyllum tunbridgense. B. H. unilaterale.

PLATE XLIX B.

WILSON'S, OR THE UNILATERAL FILM FERN

(HYMENOPHYLLUM UNILATERALE).

HYMENOPHYLLUM, *Smith.*

Clusters of Spore-cases enclosed within extra-marginal two-valved sub-urceolate involucres, of the same texture as the frond. *Spore-cases* globular compressed, with a transverse ring sessile around the columnar receptacle, bursting vertically. *Receptacles* (extra-marginal extensions of the veins) free, and included within the involucres, sub-clavate. *Veins* disunited at their extremities, simple or forked.

H. UNILATERALE: fronds pellucido-membranaceous, pinnate, oblong-elongate or linear; pinnæ decurved, sub-unilateral, digitatoly pinnatifid, slightly decurrent, forming a narrow wing in the upper part of the rachis; segments linear undivided, or bifid, spinulosely serrate; involucres axillary, solitary, stalked, ovate, inflated, the valves entire.

HYMENOPHYLLUM UNILATERALE, *Bory MS.* Willdenow, *Species Plantarum*, v. 521. Newman, *History of British Ferns*, 301. Moore, *Handbook of British Ferns*, 209. Sowerby, *Ferns of Great Britain*, 70, 48. Sprengel, *Systema Vegetabilium*, iv. 133. Presl, *Hymenophyllaceæ*, 52. Hooker fil. *Flora of New Zealand*, ii. 41.

HYMENOPHYLLUM WILSONI, Hooker, *British Flora*, ... 450. *Species Filicum*, 95. Wilson, *Supplement to English Botany*, 2686. Hooker and Arnott, *British Flora*, ... Mackay, *Flora Hibernica*, 335. Babington, *Manual of British Botany*, 416. Bentham, *Florula ... Borbonica* ... Presl, *Hymenophyllaceæ*, 3...

HYMENOPHYLLUM TUNBRIDGENSE, ... Kaulfuss, *Enumeratio Filicum*, ... 1...

HYMENOPHYLLUM TUNBRIDGENSE, Anon ... x ... 65.

HYMENOPHYLLUM PERUVIANUM, Desvaux, *Prodromus*, 3..., according to Hooker.

HYMENOPHYLLUM MAGELLANICUM, Presl, *Hymenophyllaceæ*, 31 ..., according to Hooker.

HYMENOPHYLLUM MEYENI, Presl, *Hymenophyllaceæ*, 3..., according to Hooker.

TRICHOMANES PELTATUM, Poiret, *Encyclopédie Botanique*, ... according to Hooker.

TRICHOMANES TUNBRIDGENSE, Bolton, *Filices Britannicæ*, ... 21.

EXPLANATION OF THE PLATE.

PLATE XLIX B. HYMENOPHYLLUM UNILATERALE, from Windermere, Westmoreland. ...

HABITAT. This species is more commonly distributed than *H. tunbridgense*, though the two plants very frequently occur in company. The present is met with in the south-west of England, and is reported from several midland counties. Both North and South Wales produce it, and in the north of England, especially in the Lake District in the north-west, it becomes plentiful. It is the commoner of the two species in Scotland, occurring both in the Lowlands and Highlands as far north as Sutherlandshire, and extending even to the Northern and Western Isles. In Ireland it occurs plentifully, and in all the provinces. Its altitudinal range (as this plant is found from the coast level to an elevation of upwards of 3700 feet, which it attains in the Grampians, according to the observations of Dr. Balfour and Mr. Babington.

GEOGRAPHICAL DISTRIBUTION. This plant occurs in the north of Europe, in Norway, and the Faroe Islands, and is probably generally dispersed over Europe, but the records are scanty. We have met with no Asiatic specimens. It is, however, found in the island of Bourbon and in South Africa, the latter assuming a somewhat different form, the segments being narrower. It is again met with towards the extremity of the South American continent, in Terra del Fuego, at Valdivia, at Cape Horn, and in the Falkland Islands (*Dr. Hooker* and *Mrs. Bray*). It is also found abundantly in Tasmania (*Dr. Hooker*), and apparently also in New Zealand.

Rhizome rigid, filiform, dark brown, creeping, branched and forming dense entangled masses, bearing a few hair-like scales about the bases of the fronds. *Fibres* slender, downy.

Stipes slender, wiry, terete, varying in length one-third the length of the frond, often less, distant and lateral on the rhizome, and adherent to it. *Rachis* terete, below narrowly winged above.

Vernation circinate.

THE UNILATERAL FILM FERN

Fronds smooth, pellucid-membranaceous, minutely cellular, dark green, from one or two, to five or six inches [illegible] to-oblong, pinnate. *Pinnæ* decurrent in the upper part and there forming a narrow wing to the rachis, distinct below, curved backwards, subunilateral, wedge-shaped in circumscription, digitately pinnatifid, *i. e.* two or three times dichotomously forked without an axial vein, the segments developed on the anterior side. *Ultimate segments* linear, obtuse, spinulosely serrate. Luxuriant fronds have a tendency to become branched.

Venation [illegible] of two or three dichotomous ramifications of the wiry ribs, which branch alternately from the main rachis, each ultimate segment having one of these branches along its centre, not quite reaching to the apex.

Fructification produced on the upper parts of each annual growth, extra-marginal as in *H. tunbridgense*. *Sori* consisting of sessile spore-cases, clustered around the short receptacle. *Receptacle* free, central, spongy, oblong, club-shaped, shorter than the valves of the involucre. *Involucres* supra-axillary, more or less obviously stalked, curved forwards, *i. e.* in a direction opposite to that of the segments; inflated, two-valved, the valves ovate-oblong, strongly convex, and quite entire at the edges, which are at first closed, but at length become gaping. *Spore-cases* sessile, vertically compressed, thus lenticular, obliquely affixed. *Spores* minute, irregularly oblong. In some instances, especially where the frond becomes branched at the apex, numerous sori are borne without order on the segments. But usually they are confined to one on each pinna, next the rachis, as in *H. tunbridgense*.

Duration. The rhizome is perennial. The fronds are perennial enduring for two or three years, or more, renewing their growth annually, as occurs in *Lycopodium annotinum*.

We are indebted to Mr F. Clowes, of Windermere, for the interesting observation that the fronds of this species of *Hymenophyllum* resume their growth after the first year, unlike those of *H. tunbridgense*, which complete their growth in one season. Mr Clowes gives the following account of his observations: "I have a large plant of *H. tunbridgense* and of *H. unilaterale*, which were put into a case in March, 1854. Both are growing vigorously. But I remark that *all* the fronds of *H. tunbridgense* are annual—I mean, they come up in spring, bear fruit more or less, persist more or less, but never *grow* more than one year. Those of *H. unilaterale*, on the contrary, go on growing year after year. A great number of the fronds which were on the plants when placed in the case went on growing, bore fruit at or near the extremity of the fronds that year, grew on again last year, and bore fruit, and are doing the same this year (1856), so that some fronds are ten inches long, and wide in proportion. This is not the effect of cultivation, as the wild plant does exactly the same—growing 'anacrimously,' in fact, but without distinct marks between the growths.

The cultivation of the Film Ferns is an object of much interest to the fanciers of British Ferns. The plants require a glass covering to preserve about them a constantly moist atmosphere, and [illegible] stagnant [illegible] should be maintained about their roots. These are their main [illegible] and it matters little how they are applied, whether in a Wardian case or beneath a common bell-glass. We learn from Mr Clowes whose success is evident from his remarks already quoted, that the bell-glasses ought always to have two small apertures, as vents, near the top of the glass. Until he adopted this expedient, his efforts to cultivate the Film Ferns were attended with but little success.

PLATE L.

THE ROYAL, OR FLOWERING FERN

(OSMUNDA REGALIS).

OSMUNDA, *Linnæus.*

Clusters of Spore-cases naked, densely clustered on contracted rachiform portions of the frond, forming (in the British species) terminal panicles of nodulose spikelets. *Spore-cases* large, stalked, reticulated, subglobose, two-valved, opening vertically, the transverse ring rudimentary. *Veins* forked, *venules* distinct at their extremities.

O. REGALIS fronds bipinnate, pinnules oblong, nearly entire, dilated, and more or less auricled at the base, (rarely tripinnate); spore-cases clustered in twice-branched panicles at the apex of the fronds.

OSMUNDA REGALIS, *Linnæus, Species Plantarum,* 1521. *Bolton, Filices Britannicæ,* 6, t. 5. *Smith, English Botany,* ed. 1, 209. *English Flora,* iv. 314. *Hooker and Arnott, British Flora,* 578. *Hooker, Flora Londinensis,* v. 4. 166; (*ornis vernacea*). *Genera Filicum,* t. 16 A. *Mackay, Flora Hibernica,* 345. *Gray, Natural Arrangement of British Plants,* ii. 3. *Babington, Manual of British Botany,* 417. *Newman, History of British Ferns,* 206. *Moore, Handbook of British Ferns,* 2[illegible]. *Deakin, Florigraphia Britannica,* iv. 36. *Sowerby, Ferns of Great Britain,* 78, t. 15. *Schkuhr, Kryptogamische Gewächse,* 147, 145. *Willdenow, Species Plantarum,* v. [illegible]. *Sprengel, Systema Vegetabilium,* [illegible] 21. *Presl, Supplementum Tentaminis Pteridographiæ,* 6[illegible].

APHYLLOCALPA REGALIS, *Cavanilles,* [illegible] *Annales des Sciences Naturelles,* v. [illegible] 64. *Prælectiones* (1802), 550.

STRUTHIOPTERIS REGALIS, *Bernhardi, Schrader's Journal für die Botanik,* 1800, ii. [illegible].

EXPLANATION OF THE PLATE.

PLATE L. OSMUNDA REGALIS; from Brentwood, Essex. *S. F. Gray.*

HABITAT. The Flowering Fern, also known as the Osmund Royal, grows in wet, spongy, or boggy places, and is widely and plentifully dispersed, scattered here and there in suitable localities, over the United Kingdom from Cornwall and Suffolk to Shetland and the Western Isles. [illegible] is abundant in many parts of Ireland, and is found in the Island of Jersey. [illegible] reaches an elevation of about 600 feet.

GEOGRAPHICAL DISTRIBUTION. This Fern is common throughout Europe. In Asia, it is found in Mongolia, and in India, in Concan, the Neilgherries (narrow pinnules), Kumaon, and in the Himalayas (*Hb. Hooker*). In Africa, in the Azores, in Algeria, at the Cape of Good Hope, in Natal (narrow pinnuled form), and in Madagascar (*Hb. Hooker*). In North America, it is found in Newfoundland, Canada (with narrow pinnules), in Saskatchewan, and in the United States (*Hb. Hooker*). It is also found in Northwest Mexico, and in the country of the Rio Grande in Brazil (*Hb. Hooker*). Both North and South America also yield other very similar plants which are probably to be regarded as distinct varieties of this species. One of the most striking and elegant of these is the *O. spectabilis* of North America, which may be known by its smaller size, and smoother sub-glaucous surface; another, the *O. palustris* of Schrader from Brazil, Mexico and New Granada, is a more rigid and larger plant, but with narrow and numerous pinnules. The Indian species with the aspect of *O. regalis* in its barren fronds differs in producing distinct fertile fronds.

Caudex stout, firm, growing in tufts, dark-coloured, spreading, or erect and trunk-like, often attaining an elevation of two feet or more. *Fibres* numerous, stout, branched.

Stipes nearly or quite as long as the leafy part of the frond, and as well as the *rachis* succulent, tinged with red, and clothed with loose deciduous pale-brown cobwebby wool when young, firm, smooth, and pale green when mature, terete, somewhat flattened in front, the base dilated, with a membranaceous margin. *Secondary rachis* channelled and margined in front.

Vernation circinate.

Fronds numerous, terminal and adherent to the caudex, erect, or sometimes arching, variable in height, two to four feet in more exposed and drier localities, six to eight or even occasionally ten to twelve feet in very damp sheltered spots, membranaceous, smooth, bright yellow-green, paler beneath,

broadly lanceolate, bipinnate, occasionally tripinnate some entirely barren, others having several of the upper pinnæ transformed into a terminal fertile panicle. *Pinnæ* (sterile) nearly opposite, lanceolate or ovate-lanceolate, imparipinnate, distant. *Pinnules* opposite or alternate, one to two inches long sessile oblong or oblong-ovate, obtuse, sometimes slightly falcate, rounded or somewhat dilated at the base especially on the posterior side, sometimes distinctly auricled, occasionally deeply lobed serrate with the lobes separated; the terminal ones, which are more acute than the rest, usually lobed at the base, the margins are obscurely crenated, or sometimes serrated.

Venation of the sterile pinnules consisting of a stout midvein giving off nearly opposite veins, which are forked once near their base, and again once or twice before reaching the margin in which they are lost, they are parallel and slightly curved

Fructification consisting of the upper pinnæ (usually wholly, sometimes only in part) changed into a bipinnated panicle of contracted rachiform capsul ferous divisions. Each short spike-like branch of this panicle represents one of the pinnules, the spore-cases being collected on it into little more or less evident nodules, each of these nodules corresponding to a fascicle of the veins. This is quite evident in the case of the partially transformed pinnules. *Spore-cases* subglobose, reddish-brown, reticulated, scarcely stalked, two-valved, opening vertically *Spores* smoothish, globose ovate or oblong

Duration. The caudex is perennial. The fronds are annual, growing up very rapidly early in May, the panicles reach maturity early in summer, and soon decay, and the fronds themselves are destroyed by the autumnal frosts

This the most stately of the British Ferns, well deserving the striking name assigned to it, is at once known from all other native species, by its entirely fertile panicle terminating the otherwise leafy fronds. There is moreover abundant technical distinction, in the structure of its spore-cases.

It is a very handsome plant at all times, but especially beautiful when, in very luxuriant growth its fronds loaded at their tips by the fertile panicles are bent down gracefully until they almost reach the surface of the water by the side of which they are growing. Hence it should always find a place in cultivated collections. It is of easy culture, requiring much moisture, and preferring a peaty soil. By the margin of lakes or streams, or at the base of a rockery abutting on an artificial bog or pool the *Osmunda* would find itself at home, and no special culture would be necessary Like most other ferns it grows finest in sheltered places. It is increased by dividing the tufts, but it is by far the best plan in planting such species as the present, to procure vigorous masses from the localities where they are spontaneous

NATURE PRINTING.

Osmunda regalis.

PLATE LI A

THE COMMON MOONWORT (BOTRYCHIUM LUNARIA).

BOTRYCHIUM, *Swartz.*

Clusters of Spore-cases naked, clustered on and entirely occupying a contracted branch of the frond, forming a panicle of secund spikelets. *Spore-cases* large, sessile, globose, biserial, fleshy-coriaceous, not reticulated, and without a ring, two valved, opening vertically. *Veins* flabellato-furcate, *venules* disunited at their extremities.

B. LUNARIA, fronds solitary, barren branch oblong pinnate, the pinnæ lunate or fan-shaped, with the margin jagged or crenate.

BOTRYCHIUM LUNARIA, *Swartz, Schrader's Journal für die Botanik* 1900, ii. [illegible]. *Smith, English Flora*, iv. [illegible]. *Hooker, Flora Londinensis*, iv. 66. *Genera Filicum*, [illegible]. *Hooker and Arnott, British Flora*, 578. *Babington, Manual of British Botany*, [illegible]. *Deakin, Florographia Britannica*, iv. 31. *Newman, History of British Ferns*, 364. *Moore, Handbook of British Ferns*, 2[illegible]5. *Sowerby, Ferns of Great Britain*, 97. [illegible]5. *Schkuhr, Kryptogamische Gewächse*, 150 t. 164. *Willdenow, Species Plantarum*, v. 61. *Sprengel, Systema Vegetabilium*, iv. 23. *Presl, Supplementum Tentamines Pteridographiæ*, 43.

BOTRYCHIUM LUNATUM, *Gray, Natural Arrangement of British Plants*, ii. 19.

OSMUNDA LUNARIA, *Linnæus, Species Plantarum*, [illegible]. *Bolton, Filices Britannicæ*, 4. t. 4. *Smith, English Botany*, v. [illegible]318.

OSMUNDA LUNATA, *Salisbury, Prodromus*, 40[illegible].

OPHIOGLOSSUM PENNATUM, *Lamarck, Flore Française*, [illegible].

Var. **RUTACEUM**, barren branch deltoid, pinnate, the pinnæ linear pinnatifid.

BOTRYCHIUM LUNARIA 3, *Smith, English Flora*, v. 315.

BOTRYCHIUM RUTACEUM, *Swartz, Schrader's Journal für die Botanik* 1800, ii. 110. *Willdenow, Species Plantarum*, v. 62. *Schkuhr, Kryptogamische Gewächse*, 157 t. 165 fig. b. (excl. fig. a.). *Presl, Supplementum Tentaminis Pteridographiæ*, 44. *Newman, History of British Ferns*, 320. *Babington, Manual of British Botany*, ed. i. 429. *Gray, British Plants*, ii. [illegible]9.

BOTRYCHIUM MATRICARIÆ OLIUM, *A. Braun, Roch's Synopsis*, ed. 2. 972. *Wood's Tourists' Flora*, 426.

OSMUNDA LUNARIA 3 REMOSA, *Roth, Flora Germanica*, iii. 32.

EXPLANATION OF THE PLATE.

PLATE [illegible] BOTRYCHIUM LUNARIA. 1, from Chislehurst, Kent. *G. B. Wollaston*. 2, from Ruthin, Denbighshire. *T. Pritchard.*

HABITAT.—A widely-diffused, but local species, found here and there over the whole of England, Wales, and Scotland, extending to the Islands of Orkney and Shetland. It has been less frequently found in Ireland but is reported there from all the provinces. It is found in dry open elevated pastures and waste lands generally skirting the bushes which occur in such localities. Though abundant in some of its habitats, and general in its distribution, it can hardly be considered as a common species. Its altitudinal range is stated to reach from the coast here to about 2700 feet above the sea. The plant referred to *rutaceum* has been gathered on the sands of Barry, Forfarshire.

GEOGRAPHICAL DISTRIBUTION. The Moonwort is reported to occur in various parts of Europe from Ireland, the North Cape and Laptland, to Sicily and Spain, and the Russo-Caucasian provinces. In Asia, as Sikkim and Sumaon in the Himalaya, *Hb. Hooker*; in Siberia, in the regions of the Ural and Altai Mountains, and Lake Baikal extending to Kamtchatka and Unalaschka. In North America, in Newfoundland, Greenland, Bear Lake, the Saskatchewan, and Rocky Mountains, to Behring's Strait in North West America. It also occurs in Fuegia, and in Tasmania, and has been recently met with by Dr. Müller on the Australian Alps, in Victoria. *B. rutaceum* is a native of the northern and central parts of Europe, and therefore, although scarcely to be considered as a settled member of our Flora, it is not unlikely to be so. The North American *B. simplex* is probably the small state of a fern, found about Hudson's Bay and the Saskatchewan, and in Canada, intimately allied to *B. rutaceum*.

Corm-like Crown forming a small scarcely thickened wiry-rooted descending axis (rhizome, *Presl*), terminated by a bud or growing point, enclosed by brown membranaceous sheaths. *Roots* stoutish, fleshy, brittle, branched, growing in an irregular spreading manner from about the crown, and also branching in a subverticulated way from the perpendicular axis beneath the crown. When at rest the plant consists of this crown or bud, or growing point, seated among the wiry roots, enclosing the incipient or rudimentary fronds, and encased by membranaceous sheaths the remains of the former fronds.

Stipes erect, smooth, cylindrical hollow, succulent, having two or three vascular bundles embedded in its tissue, its base surrounded by long brown sheaths, which are doubtless the persistent bases of former fronds, about half the height of the entire frond, dividing at top into two branches, of which one is sterile the other fertile

Vernation plicate, or folded straight, the fertile branch clasped by the sterile

Fronds from three to eight or ten inches high, firm, stout, fleshy *Sterile branch* smooth, dark glaucous green, pinnate. *Pinnæ* four to six or seven pairs, flabellate or lunate, the margins nearly entire or somewhat crenate, or more or less lobed, sometimes partially fertile. *Fertile branch* pinnate or bipinnate, the narrow rachis-form spikelets (whether answering to pinnæ or pinnules) fleshy, flattened and bearing on the face towards the sterile branch a double row of erect spore-cases, so that these spikelets are secund, and they are moreover more or less incurved, or suberect. Sometimes more than one fertile branch is produced, and occasionally spore-cases occur on the edges of the barren pinna

Venation of the barren pinnæ flabellate-furcate, i. e. the vein enters at the base, and becomes forked over and over again until the whole space is traversed by the contiguous slightly radiating veins and venules that do not extend quite to the margin

Fructification occupying the flattened rachis-form divisions of the separate fertile branch of the frond *Spore-cases* sessile, standing erect i. e. at a right angle to the plane of the segments in two rows bordering each of these segments near the margin, smooth, spherical, without apparent rings or reticulations, bursting transversely golden brown when mature. *Spores* smooth, roundish, oblong or angular pale-coloured

Duration. The crowns and roots are doubtless perennial. The fronds are annual, growing up in April or May, and becoming fully grown in June, afterwards gradually drying up and perishing with the summer's drought

The ordinary state of the Moonwort may be known by the double row of fan-shaped pinnæ which form the sterile branch of its frond. It is a plant not easily distinguished from the herbage among which it grows, and on that account is probably often passed over without recognition

The variety *rutaceum*, which is perhaps entitled to specific rank, differs in its broader triangular twice-cut barren branch—as though the form of the fertile branch were transferred to the barren—and by the linear form of the secondary divisions. It is reported to have been found near Buxton in Derbyshire, and on the sands of Barry near Dundee, but very sparingly We have not seen a native specimen. Though the *B. rutaceum* is by no means an unlikely plant to occur in Great Britain, the fact of its occurrence must, as yet, be regarded as doubtful

No very marked success has been met with in cultivating the *Botrychium*. Mr Newman regards it as an emergent parasite which view is at least doubtful, as the plants have been dug out with the utmost care without any trace of adhesion to the roots of surrounding plants being discovered. The difficulty of growing it, is probably after all chiefly owing to the almost unavoidable fluctuations of moisture to which artificially-cultivated plants are subject, and which, judging from the natural sites in which this plant grows, it is unable to bear The best chances of success are to dig up the plants while growing with sods of the natural soil large enough to enclose the roots uninjured, or to take them with less soil at the dormant period, the position of the plants having of course been previously marked, in either case to plant them in considerable masses of soil made up so as to imitate that from which they were taken as closely as possible, whether it be sandy loam or an unctuous peat, in both which they occur Care must be also taken to keep the soil cool, and moderately as well as equably moistened. The plan of transplanting at the dormant period is certainly most in accordance with theoretical notions of success, and probably the shade afforded by other herbage such as grass, to the surface of the soil, would be found beneficial to the plants.

Plate Lf n

THE COMMON ADDER'S TONGUE,

(Ophioglossum vulgatum).

OPHIOGLOSSUM, *Linnæus*

Clusters of Spore-cases [illegible] arranged in a [illegible] distichous spike, forming a con[illegible] branch of the frond. *Spore-cases* [illegible] along the margin of the compressed spike [illegible] without reticulations, horizontal [illegible] but [illegible] [illegible] with the spike, opening [illegible] two valves transversely to the axis [illegible] constitute [illegible] reticulated [illegible] elongated hexagonal areoles with [illegible] free [illegible]

O. vulgatum fronds usually solitary, barren branch ovate obtuse, fertile branch linear

[illegible]

EXPLANATION OF THE PLATE.

Plate [illegible] Ophioglossum vulgatum [illegible] from [illegible] *E. G. Edwards* [illegible] Exeter [illegible]

[illegible]

Corm-like Crown forming a thickened fusiform descending axis (rhizome, *Presl*), terminated by a bud or growing point enclosed by a few brown membranaceous sheaths. *Roots* [illegible] spreading horizontally [illegible] branched, growing in a somewhat whorled manner from the crown [illegible] perpendicular axis, one (or more?) elongated under-ground in a stolon-like manner, and producing a new crown at a distance from the parent. [illegible] exterior to the former fronds, at the apex of the crown.

Stipes erect, smooth, cylindrical, hollow, succulent, usually elongated to about two-thirds the height of the frond, traversed by two or three vascular bundles, the base enclosed by [illegible] sheathing scales, divided above into a separate fertile and barren branch.

Vernation [illegible] straight, the sterile branch enclosing the spike of fructification.

Fronds from three or four inches to a foot in height, [illegible] but somewhat [illegible] *Sterile*

branch smooth, entire, sessile, broadly-ovate or ovate-elongate, acutish or obtuse, pale yellowish-green. *Fertile branch* erect, consisting of a simple spike terminating a more or less elongated footstalk which appears to spring from the inner base of the sterile branch; *spike* linear, very slightly tapering upwards. Occasionally more than one fertile spike is produced, but it is very seldom that more than one frond is produced from each crown.

Venation of the barren branch consisting of a series of uniform *veins* (no midvein) everywhere anastomosing and forming a series of narrow elongated hexagonal areoles, those towards the circumference becoming shorter and broader; within these are a series of lesser veins (*venules*) dividing the areoles into other smaller ones of similar form. From the sides of these areoles, branch, more or less abundantly, short divaricate, free included *veinlets*, which are usually more numerous near the margin.

Fructification occupying the margins of the linear spike, which terminates the contracted fertile branch. *Spore-cases* smooth, spherical, without rings or reticulations, embedded in a single series in each margin of the spike, bursting transversely, and then forming gaping concavities which give a toothed appearance to the margins. *Spores* verruculate, roundish, pale-coloured.

Duration. The crowns and roots are perennial. The fronds are annual, growing up in May, reaching maturity in June or July, and then gradually drying up and perishing.

The Adder's Tongue, with its broad oval barren branch, and linear fertile branch, is so unlike other British Ferns, that it may be at once distinguished by these features. Its simple barren branch does not present much variation, the principal differences lying between a short broad oval outline, and a more elongated oval approaching to lanceolate.

A somewhat marked variety, however,—*O. vulgatum minus*—perhaps the *O. azoricum* of Presl. (*Hochstett, Hb. Azor. Un. Itin.* 165) has been found by Mr Syme in Orkney. This is a much smaller plant, the barren branches of a narrow oval outline, and the plant reaching maturity in September, at which period the common form has decayed. The venation is the same as in the common form. The small size and narrow outline of this plant have induced some botanists to unite *O. vulgatum* with *O. lusitanicum*, as forms of one species, the plant now referred to being taken as one of principal connecting links; but this combination is surely carrying the so-called reduction of false species to an unnecessary length, and is at least as confusing as the opposite practice.

Though of similar habit to the *Botrychium*, this plant is more readily cultivated. The roots should be taken up without being broken, in sods of the soil in which they grow, and these should be planted in similar soil, in any moderately exposed situation, where the roots may be moist and cool, but not liable to excessive wetness. Loamy soil is generally preferred. It is one of those plants which seem to derive benefit from the shade of surrounding herbage, and in consequence 'gardenesque' neatness is inimical to it.

A . Botrychium Lunaria .

B . Ophioglossum vulgatum . C . O. lusitanicum

PLATE LI. C

THE DWARF ADDER'S TONGUE,

(OPHIOGLOSSUM LUSITANICUM).

OPHIOGLOSSUM, *Linnæus.*

Clusters of Spore-cases naked, arranged in a simple distichous spike, forming a contracted branch of the frond. *Spore-cases* uniserial along each margin of the compressed spike, leathery, without reticulations, horizontal, globose, but sunk in or connate with the spike, opening in two valves transversely to the axis. *Veins* (ecostate in British species) uniform, reticulated in elongated hexagonal areoles, with or without free included *venules*.

O. LUSITANICUM fronds solitary, or two-three from each crown; barren branch linear or linear-lanceolate, small, thick, fleshy; fertile branch linear-oblong apiculate.

OPHIOGLOSSUM LUSITANICUM, *Linnæus, Species Plantarum,* 1518. *Moore, Popular History of British Ferns,* 2 ed., 337, pl. 22, fig. 3. *Newman, History of British Ferns,* 331. *Sowerby, Ferns of Great Britain,* 82, [illegible] 47. *Babington, Manual of British Botany,* 4 ed., 429. *Willdenow, Species Plantarum,* v. 61. *Sprengel, Systema Vegetabilium,* iv. 22. *Presl, Supplementum Tentaminis Pteridographiæ,* 50. *Hooker and Greville, Icones Filicum,* t. 86. *Lindley, Vegetable Kingdom,* 2 ed., 77, figure.

EXPLANATION OF THE PLATE.

PLATE LI. C. OPHIOGLOSSUM LUSITANICUM, from Guernsey; *G. Wolsey* and *C. Jackson.*

HABITAT. This diminutive species was found in 1854 by Mr. G. Wolsey in the neighbourhood of Petit Bot Bay on the south coast of the island of Guernsey, and it has since been more abundantly in other localities in that island, whence both Mr. Wolsey and Mr. C. Jackson have furnished specimens. It seems probable that a diligent search would be rewarded by its discovery in the western counties of England, or in Ireland. It must, however, be sought in midwinter.

GEOGRAPHICAL DISTRIBUTION. This Fern is found in the European countries bordering the Mediterranean, Portugal, Spain, France, Italy, Sicily, and Algeria, as well as in many of the islands of that sea. It grows also at Tangiers, Algiers, and probably elsewhere on the African coast, and in the [illegible] Islands, the [illegible] Madeira, Teneriffe, and the Azores; it is again found at Swan River, and in New Zealand (*W. Hooker*). A closely allied plant, perhaps identical with this, has been found by Dr. Spruce at St. Gobea; and others similar have been met with in New Grenada, in Java, and in Borneo. A Tasmanian plant referred to [illegible] as comparatively broader in its fronds [illegible] from the [illegible] of Tunis, is both taller and stouter, and a [illegible] from St. Helena, is also similar. These are all at least closely allied to *O. lusitanicum*. The *O. minimum* of [illegible], from New Zealand, is a diminutive of this [illegible] allied species.

Corm-like Crown forming a thickened, oblong-fusiform blunt descending axis (rhizome, *Presl*), the terminal bud or growing point conical, and enclosed by a few brown membranaceous sheaths. *Roots* coarse, brittle, fleshy, spreading or descending, unbranched, growing irregularly from the axis, one (or more?) becoming elongated in a stolon-like manner, and producing a new crown towards its extremity.

Stipes erect, smooth, cylindrical, succulent, one-third to one-half the height of the frond, furnished with two or three slender vascular bundles, the base enclosed by membranaceous sheathing scales, which are taper-pointed above, dilated below; divided into a separate fertile and barren branch or terminating in a barren frond.

Vernation plicate or folded (fig. 1).

Fronds from one to three inches high, thick and fleshy or succulent in texture, of a pale green colour. *Sterile radical fronds* (commonly but not always accompanying the fertile fronds) linear-lanceolate, smooth, tapering below into the stalk or stipes. *Sterile branch* of the fertile fronds linear, or more frequently linear-lanceolate, tapered below to its junction with the fertile branch, spreading, bluntish, from three-fourths of an inch to one and a half inch long, somewhat elevated at the margins.

THE DWARF ADDER'S TONGUE.

Fertile frond [illegible] a spike supported [illegible] stalk which [illegible] broad, fleshy, and flattened at the base of the spike; *spike* linear [illegible] apiculate, about half an inch long, often rather widened a little above the base, fleshy and bearing along each margin from three to six spore-cases. A barren frond generally accompanies the fertile frond, and sometimes more than one fertile frond is produced from one crown.

[illegible] of the barren [illegible] of a series of [illegible] branching so as to produce a series of nearly parallel venules, which here and there anastomose, forming a few long narrow areoles. There are apparently no free included [illegible]

Fructification occupying the margins of the spike. *Spore-cases* smooth, spherical, without rings or reticulations, embedded in a single series of from three to six, in each margin of the spike, bursting transversely. *Spores* smooth, roundish or angular, pale-coloured.

Duration. The crown and roots appear to be perennial, though it has been suggested that they are biennial. The perennial character of the plant may perhaps be maintained by the successive production of crowns. The habits of the whole group *Ophioglossaceæ* are, however, little known. The fronds are annual, growing up in winter and fully developed by the middle of January.

This curious little plant, one of the most recent additions to the list of British species, may be known from the Common Adder's Tongue by its small size, its thick fleshy texture, and the narrow outline of the sterile branch of its frond. The plants average about a couple of inches in height, and rarely exceed three inches. It is an extremely interesting plant, and we think may fairly be allowed to remain separate from *O. vulgatum*—unless indeed in the Vegetable kingdom we must adopt the rule of combining under the name of a species a lengthened series of widely dissimilar forms, if they happen to be at all seemingly connected; a practice, which at the least would be equally inconvenient with the more fashionable mania for subdivision and separation. As in other simple-fronded genera, the species are, however, really difficult of limitation.

The most successful attempts that have been made to cultivate this little plant have consisted in taking up the plants in little clods of soil, and planting them in a compost of sandy loam, which resembles the soil in which they naturally grow. In this way, the plants may be occasionally preserved and induced to reappear at the proper season; but like all the allied species it can hardly be considered as a manageable plant in the cultivator's hands.